

PUBLIC WORKS

April
1952

CITY, COUNTY AND STATE

**Solving a Water
Department's
Materials Problem**

**Civil Defense for
New Jersey's Water Works**

**Cutter and Chipper
Reduce Brush Cutting Costs**

**How to Test for
Fluoride Content of Water**

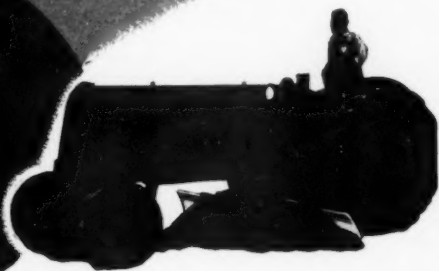
**Mechanizing Highway
Maintenance in Texas**

**Faster Repaving for
9,000 Street Openings**



Prof. James J. Doland of the University of Illinois, where he is Professor of Hydraulic Engineering. He is shown here against the University Airport, which he designed and built. More on page 22.

Some of the Jobs Are Doing



NATIONAL GOVERNMENTS

Grading and maintenance work on highways and secondary roads in national parks, reservations, national public lands.

STATES

Highway grading and maintenance service of many kinds including berm grading, mowing, ditch cleaning, etc.

COUNTIES

Highway and secondary road grading and maintenance work. Counties owning attachments keep HUBERS busy every month of the year.

MUNICIPALITIES

Street and alley grading and maintenance; every type of maintainer attachment is in municipal service.

TOWNSHIPS

Townships charged with road maintenance are among favorite users of Huber Maintainers for grader and maintenance work.

PUBLIC GROUNDS

Parks, playgrounds, conservation areas, publicly-owned beach areas need and use HUBERS for grader and maintenance service.

OIL FIELDS

HUBERS are at work in the oil fields, grading and maintaining off-the-highway roads and building dams around oil wells and storage tanks.

CEMETERIES

Cemeteries keep HUBERS busy every month, grading and maintaining drives, mowing, developing new grounds, removing snow, patching pavements, etc.

AIRPORTS

HUBERS are tailor-made for airport service, grading unpaved areas, patching paved areas, mowing, removing snow, towing planes, etc.

LOGGING

Grading and maintaining logging camp roads, mowing, bulldozer service.

INDUSTRIES

Many industrial users include factories with sizeable grounds and miles of roadways; lift loader widely used for cleanup work around factory sites.

MINES

Grading and maintenance of roadways; broom widely used around strip mines to sweep coal veins before removal.

ESTATES & RANCHES

Grading and maintenance of roadways; lift loader for cleanup; mower widely used.

RACE TRACKS

Grading and maintenance of track and of surrounding roadways and grounds.

CONTRACTORS

Contractors, large and small, in all kinds of contract work, are enthusiastic HUBER users. They like versatility of HUBERS, ability to move rapidly from one job to another.

HUBER MANUFACTURING CO. • Marion, Ohio, U. S. A.

*Manufacturers of Huber Maintainers, Graders
and Complete Line of Rollers*



Specify

CHICAGO "PACKAGE" PLANTS

Engineers designing a sewage treatment plant for a small community, industrial plant, or institution are assured the best performance at lowest cost with the Chicago "Package" Plant. The equipment is specifically engineered to provide the benefits of activated sludge sewage treatment to plants with design flows of .5 MGD or less. Since 1934, 250 Chicago "Package" Plants have been installed. All have excellent records for performance. None have failed.

Chicago "Package" Plants require a minimum of operating supervision, produce a sparkling clear effluent; they are free from flies, foul odors, and unsightly appearance. They can be located near dwellings.

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Ingenious automatic features of Chicago "Package" Plants simplify operation and assure successful performance. Former farmers, salesmen, coal-miners and truck-drivers — without previous experience — are operating existing plants. Operator training service by Chicago Operating Sanitary Engineers is provided with each plant if desired.

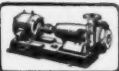
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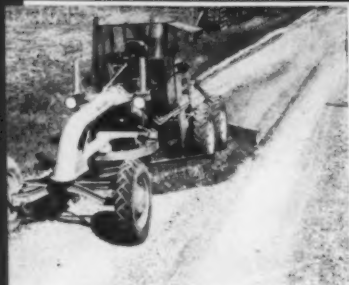
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 Microfilms, 313 N. First St., Ann Arbor, Mich.

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THE ENGINEERING AUTHORITY
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HERE'S WHAT USERS SAY ABOUT THE DEMPSTER-DIGGSTER—

"IT'S THE FASTEST, MOST EFFICIENT EXCAVATING TOOL I HAVE USED"

—A. J. METLER, Contractor

"During the past several years," Mr. Metler says, "I have owned and operated four conventional full revolving crawler and truck mounted shovels and cranes and know that they have a direct application to many types of excavating work.

"On the other hand, I have learned that the fast operation of the tricycle mounted Dempster-Diggster permits it to be used on certain types of work to a considerable advantage. Its mobility permits quicker transfer from one job to another.

"I have had excellent results from the Dempster-Diggster and consider it the fastest and most efficient excavating tool I have used."

Mr. Metler is one of the many contractors who has found the Dempster-Diggster to be "the fastest and most efficient excavating tool" available.

This speed and efficiency in excavation work is accounted for, mainly, by the Diggster's exclusive independent hydraulic crowd and hoist action, its hydraulic steering and wheel-type traction.

The power crowd permits bucket to keep digging until loaded . . . no digging with wheels. The hydraulic steering gives the driver sensitive, easy, finger-tip control. When accelerated, a one-handed twist of the steering wheel puts the machine in any desired position. By operating on rubber-tired wheels, the Diggster, of course, can move at the fastest possible speed on the job and to and from jobs.



The Type HL Dempster-Diggster is equipped for extraordinary high dumping. The bottom of bucket is 13 feet six inches above ground.



HERE IS THE NEW TYPE HL DEMPSTER-DIGGSTER shown excavating with a $1\frac{1}{4}$ cu. yd. (heaped) digging bucket. The Type HL Dempster-Diggster will dig through an 18 foot bank while the Type GRD digs through a 15 foot bank.

The Dempster-Diggster is a "must" for contractors, large or small operators alike.

The Dempster-Diggster has a 15 foot turning radius, is 20 feet long when bucket is in traveling position, and is nine feet and six inches in height.

Four standard interchangeable buckets of two types are available. Digging buckets with four bottom teeth in 1 and $1\frac{1}{4}$ cubic yard (heaped) capacities, and materials handling buckets in $1\frac{1}{2}$ and 2 cubic yard (struck) capacities.

For fast, efficient operation in difficult terrain, the Diggster is available with crawler-type traction.

"I have not personally used the Dempster-Diggster mounted on crawler treads," Mr. Metler said, "but have seen it in operation on jobs adjacent to mine. I know it is a very effective tool and has many applications."

Construction men have found that on big jobs the Dempster-Diggster has no equal for working in tight places and for freeing big shovels for heavier work. The Diggster has an 8 foot 10 inch crowing reach, will dig through a 15 foot bank, and will dig 15 inches below grade.

Pound for pound, the Dempster-Diggster will out dig and out load any other available competing machine in tough going! Let us prove that statement!

Write today for complete information and prices. The Dempster-Diggster is a product of Dempster Brothers, Inc.



This is the type GRD Dempster-Diggster, which Contractor A. J. Metler considers "the fastest and most efficient excavating tool I have used." It is shown digging 15 inches below grade.

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DIGGSTER**

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THE EDITOR'S POINT OF VIEW



Water Works, Civil Defense and Good Operation

WATER is so essential for our everyday living that we are all sensitive to the vulnerability of our water supply systems to damage by natural disasters, sabotage or enemy action. Accordingly, we are giving much space in this magazine to realistic information on planning, organization and procedures to safeguard water supplies. Because water systems are far-flung, in the sense that they cannot be closely guarded, a high degree of operational control is an absolute necessity. This presupposes a well-constructed system, free from sanitary defects, intelligently supervised and administered, and with resources in materials and equipment. Given these essential conditions, there is little to worry about. We believe the record of Army water supply during World War II bears this out. No matter what the country, the climate or the conditions of warfare, safe water was continuously supplied to our troops as evidenced by the almost entire absence of any diseases that could be attributed to the use of impure water.

In our last month's issue was an interesting article on algal toxins. It was interesting because, during the war, an unexplained epidemic of sickness occurred in a southern city which furnished water to one of our large camps. No cases of this sickness occurred in the camp, the water for which was rechlorinated in accordance with Army policy. Though very skilled sanitary engineers, bacteriologists and chemists investigated the happening, it was not possible to find anything to which the sickness could be attributed. It may have been an algal toxin or it may have been something else about which we are as yet ignorant, for we do not yet know all about water and water supplies.

Critical Materials for Public Works Needs

THERE is a smell in the air which may be only the near, we hope, approach of spring, but which seems more like a need for relaxation of the present drastic curtailment of critical materials. Some of our material controllers have been embarrassingly hard put to it to explain the need for a continuation of these controls, at least to the extent practiced in the past; and steps have

recently been taken to ease controls along these lines. The outlook for steel is not discouraging, so far as we can see. By the end of this year, the steel producing capacity of this country will be approximately 115 million tons; and there will be a further increase in capacity next year. Military requirements will total about 20 million tons this year, leaving for civilian needs more than has ever been available previously; or, we believe, has ever been needed.

We don't think that anyone can prove the necessity of deferring to an indefinite future date that needed sewage treatment plant; the new water lines or water treatment facilities; those painfully obvious highway construction needs; or the other public works facilities that make this country better, healthier and stronger. Plans for such needed improvements should be made just as soon as possible, and pushed forward as quickly as possible. By the time construction can begin, materials should be available; and prices aren't likely to be much lower for a long time to come.

Making it Hard on Those Who Took the Lead in Civil Defense

WHEN the Civil Defense program was undertaken, somewhat more than a year ago, considerable heat was turned on to get our cities and states to undertake immediately an adequate civil defense program. Many of them responded admirably, going ahead at their own expense to establish an effective organization and get things under way. Now it appears that these communities are going to be penalized for their prompt and diligent cooperation. The civil defense appropriation bill passed last November did not contain any provision for matching funds spent before that date. This means that all money spent before Nov. 1 last by cities and states will come out of their budgets wholly, without any reimbursement from Federal funds; but the laggards who waited until after Nov. 1 to start will have the benefit of such funds.

This is, perhaps, the bureaucratic way of rewarding initiative, patriotism and diligence, but it isn't a good way. The bill should be amended by Congress to insure that those cities and states that acted promptly will not be penalized.

BIG Tractor-shovel with BIG push



4-wheel drive PAYLOADER®

Contractors and Public Works men are happy with the big Model HM 1½ yd. "PAYLOADER" because of the combination of power, mobility and versatility it gives them — power and 4-wheel traction to get *big* production even when ground conditions are poor . . . mobility to get from job to job quickly at speeds up to 16 m.p.h. . . . versatility to dig, load, grade, bulldoze, spread, pull and push . . . to work on or off pavement.

This tractor-shovel also makes a hit with operators because it rides easy and has a big comfortable seat, power-assisted steering and fingertip hydraulic control.

Four speeds *reverse* as well as forward permit as fast operation in both directions as the job conditions allow, and there's a choice of gasoline or diesel power. Once you've seen a Model HM in action you'll understand why hundreds of owners and operators are its enthusiastic boosters.

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WRITE for catalog on the 1½ yd. Model HM or the six other "PAYLOADER" sizes down to 12 cu. ft. bucket capacity.



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Eliminate spalling and fractures around repair patches by sawing before breaking. Saw clean, straight lines, break smooth, then patch perfectly in building floors, runways, drives, etc.

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Saw contraction joints in continuously poured slabs and eliminate costly hand forming and usual spalling. Building floors, highways, streets, runways, walks, etc. can all be sawed.

MODEL C-130

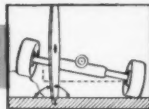
One of FIVE MODELS
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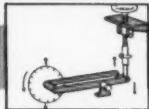
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You can TEST—actually TRY a Clipper Concrete Saw on YOUR job without obligation! Write for details!... by the Originators of Masonry Saws.

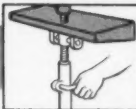
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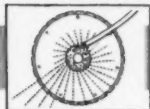
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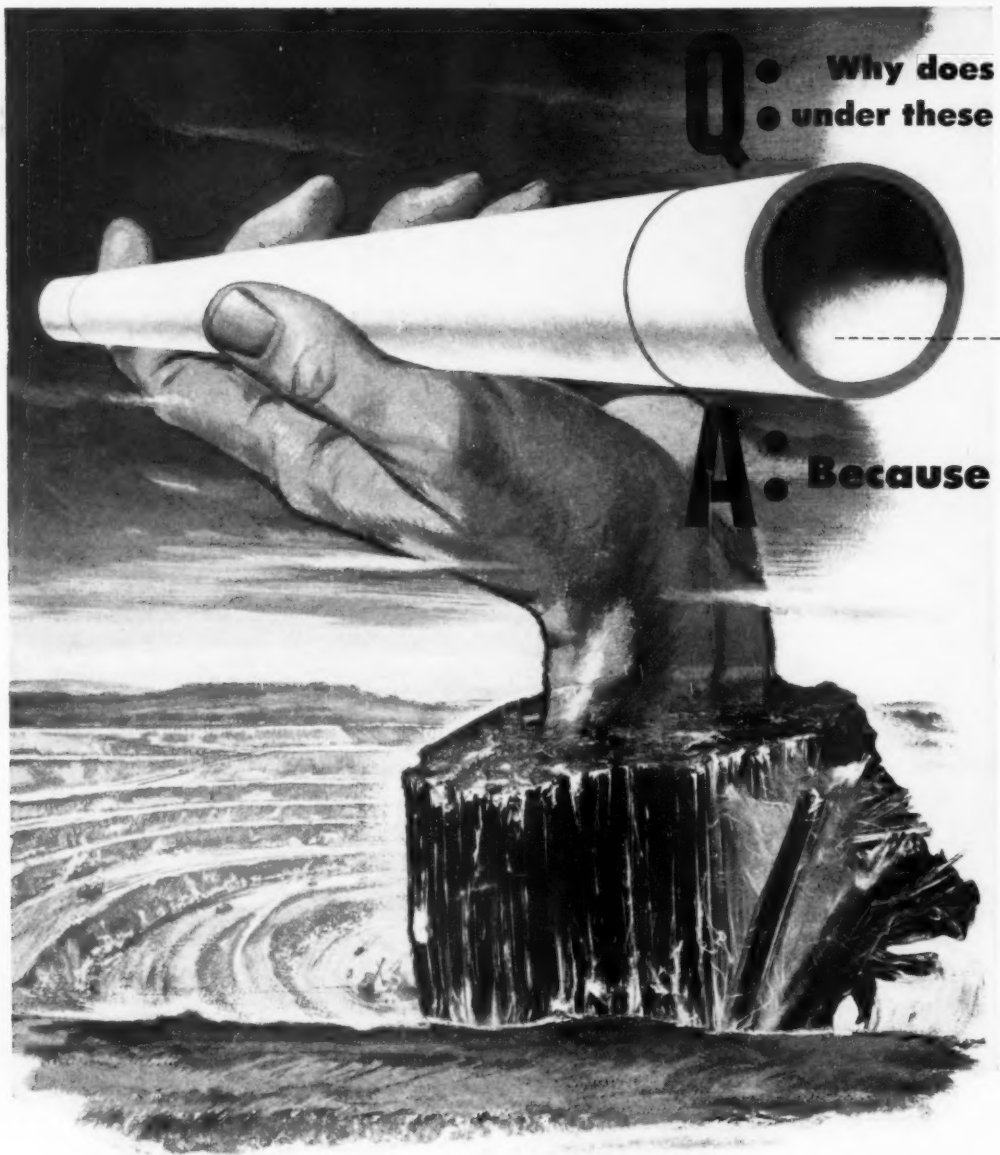
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TRANSITE PIPE last longer West Virginia city streets?

Transite Pipe was first installed in this West Virginia city in 1935. In addition to heavy street traffic, it has withstood soil conditions so destructive that the pipe previously used had a service life of only two to three years. When the Transite main was recently uncovered to insert a tap into the line, the pipe was found in as good condition as the day it was laid!



it's reinforced with ASBESTOS for lasting strength

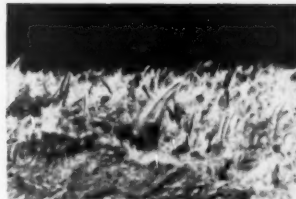
THERE IS GOOD REASON why Transite* Pressure Pipe—shown in the city street above—has already far exceeded engineers' expectations for the service life of pipe used here:

It's reinforced with tough, strong, indestructible fibers of asbestos—the mineral that defies time!

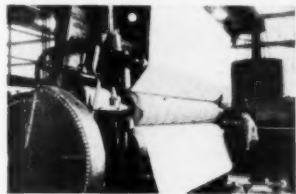
Countless numbers of these remarkably strong asbestos fibers—their tensile strength is comparable to that of steel—are dispersed uniformly throughout every length of Transite Pressure Pipe. This reinforced structure not only contributes to the *initial* strength needed in a pipe designed for use under busy city streets. Equally important, it helps assure the *lasting* strength that enables Transite Pipe to survive continued corrosive attack, year after year . . . to *stay* strong in service under conditions that are highly adverse to ordinary pipe materials.

This quality of lasting strength is one of many important advantages of a pipe engineered with modern water transportation requirements in mind. Transite's Simplex Couplings reduce water-line leakage losses to a minimum, provide flexibility to help relieve the line of soil stresses and traffic loads. Its light weight makes for easier handling and effects substantial savings during installation. Its smooth interior assures a high coefficient of flow (C-140) and, because Transite can never tuberculate, helps keep pumping costs low through the years.

To find out more about how this modern asbestos-cement pipe can help solve your waterline problems and save you money, write Johns-Manville, Box 60, New York 16, N. Y.



This photomicrograph shows how the tough, strong asbestos fibers are distributed uniformly throughout the structure of the pipe.



On machines like this, the asbestos-cement-silica mixture is "built up" under heavy pressure into a dense, homogeneous pipe structure.



Transite's flexible Simplex Couplings help relieve the line of excessive flexural stresses—an added safeguard against pipe failures.

asbestos-cement PRESSURE PIPE

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New Plant at Fond du Lac...



combines refuse incineration and sludge disposal

A large part of the heat requirements at the new sludge drying plant at Fond du Lac, Wisconsin will be provided by a refuse incinerator. This combination arrangement is typical of the trend in smaller installations and effects considerable fuel savings.

Fond du Lac Plant, which went into operation in September of 1951 will serve an equivalent population of 75,500. It is equipped with a C-E Raymond Flash Dryer Unit designed to handle 15½ tons of filter cake per day, with an evaporation rate of 2,600 pounds per hour. Although the plant is located a short distance from a public park, the use of high temperature deodorization has completely eliminated objectionable odors.

The C-E installation at Fond du Lac is typical of C-E Raymond Systems now in service in virtually all parts of the country, meeting the varying requirements of both large and small communities. They are flexible in layout, highly efficient and thoroughly reliable; they provide for maximum utilization of waste heat.

The services of C-E specialists are available to assist you in finding the best solution to your sludge problem. Get in touch with the C-E office nearest to you for prompt attention. D-552

C-E Raymond Flash Dryer Systems installed, under construction or on order since 1945

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FOND DU LAC, Wis.



COMBUSTION ENGINEERING—SUPERHEATER, INC.

FLASH DRYER DIVISION

1315 North Branch Street

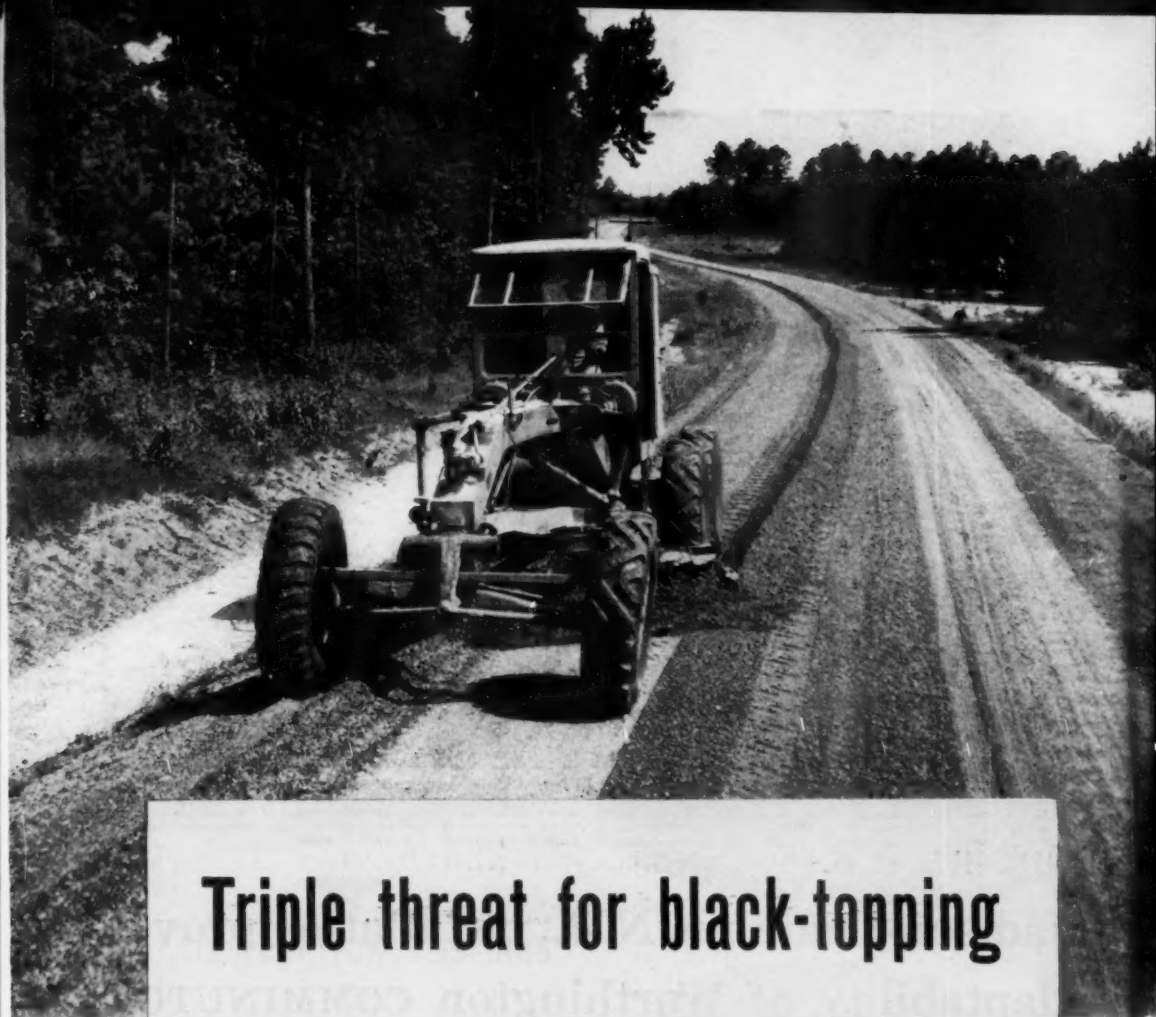
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Triple threat for black-topping

"Caterpillar" Diesel Motor Graders give you 60 minutes' work in every hour when you are resurfacing roads with black-top.

Equipped with a scarifier, these all-purpose Motor Graders will prepare the base, mix the black-top in place, and then spread it. In the picture, a "Cat" No. 12 Motor Grader owned by Union County, Arkansas, is setting up base near Eldorado at a mile-a-day clip.

"Cat" Diesel Motor Graders are year-around necessities for road work in all climates. Among their practical features are leaning front wheels for control

of side drift and aid in turning, and a full-revolving circle for working in reverse and filling holes.

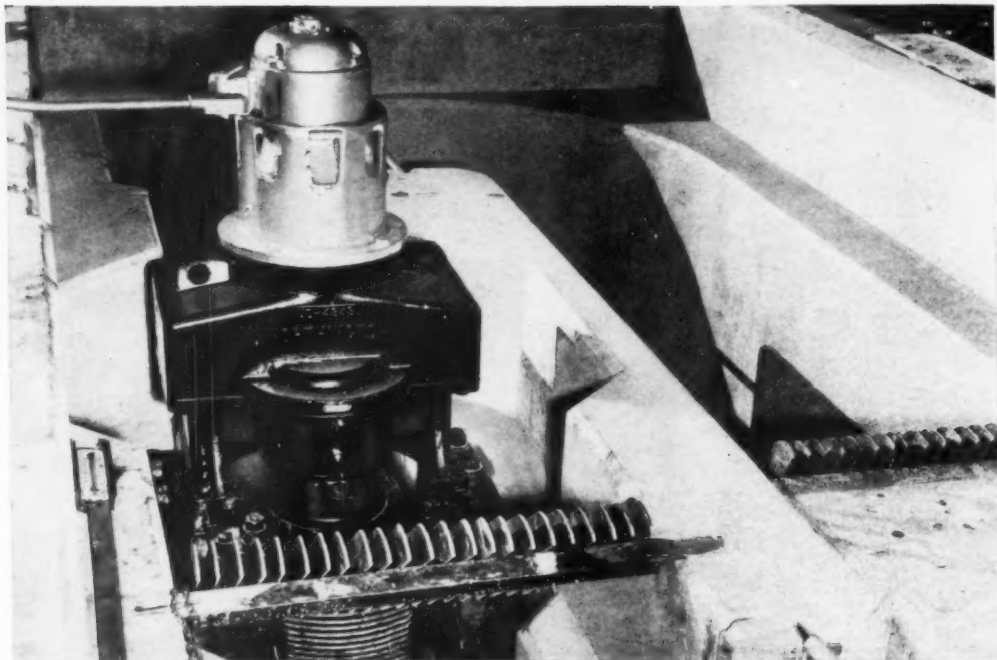
Because they are built in one factory and serviced completely by one organization, "Cat" Motor Graders live and work to ripe old ages. Their lives can be extended indefinitely by good daily maintenance. You come out ahead when minutes of maintenance become hours of productivity.

CATERPILLAR, PEORIA, ILLINOIS

CATERPILLAR

REG. U. S. PAT. OFF.

**DIESEL ENGINES
TRACTORS • MOTOR GRADERS
EARTHMOVING EQUIPMENT**



WORTHINGTON COMMUNITOR IS EASILY INSTALLED TO HANDLE LARGE VARIATIONS IN FLOW like this one at the Madison-Chatham (N. J.) Sewage Treatment Plant. Maximum wet-weather flows are occasionally as high as five times the average design dry-weather flow. An overflow screen is installed on top of the comminutor to screen flows

in excess of the comminutor's capacity. Screenings are later raked down into the comminutor during period of normal flow. The overflow screen makes the comminutor independent of the by-pass on right which may later be used as a channel for a second comminutor. Plant Superintendent is Edward P. Molitor.

Madison-Chatham, N. J., installation proves adaptability of Worthington COMMUNITOR

Typical example of the adaptability of the Worthington comminutor is the story of this installation at the Madison-Chatham Joint Meeting Sewage Treatment Plant in Chatham, N. J.

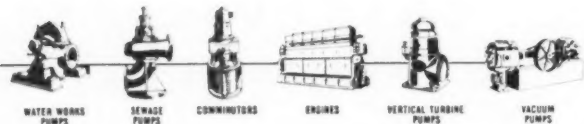
Engineers everywhere especially like the Worthington comminutor because:

- It can be readily installed in new or existing straight-flow rectangular channels.
- Cutter-racks are quickly removable for sharpening or replacement.

- It may be flooded without damage because it's protected by a mercury seal.

Worthington's public works specialists are ready to work with your community's engineer in solving screening problems—as well as other problems in sewage, water works, or municipal power generation. Write, stating details of problem or requesting Comminutor Bulletin W-2010-B3 to Worthington Pump and Machinery Corporation, Public Works Division, Harrison, N. J.

W. 2.5



WATER WORKS PUMPS

SEWAGE PUMPS

COMMUNITORS

ENGINES

VERTICAL TURBINE PUMPS

VACUUM PUMPS

All Major Public Works Equipment Under One Responsibility

WORTHINGTON

Public Works Equipment

Now's the time to mail this month's Readers' Service card.

NEENAH CONSTRUCTION CASTINGS



CONSTRUCTION CASTINGS
for
**Highway • Municipal • Building
Industrial • Communication • Public
Works • Airport • Utilities
Transportation**

Patterns for 15,000 different
Gray Iron Castings used on
Construction Projects

Write for our 135-page
Catalog "R," Second Edition

**NEENAH
FOUNDRY CO.**

NEENAH, WISCONSIN

Chicago Office—308 W. Washington St., Chicago, Ill.



Progressive Communities are Joining the Trend to Hotpoint's Municipal Plan of Food-Waste Disposal



The Hotpoint Disposall® food-waste disposer is easy to install in any sink... convenient... safe... odorless and economical. Simple to operate... keeps kitchens, sinks and hands clean. Does not overload or clog sewer systems. Can also be used with septic tank.

If you would like to provide your community with a modern, sanitary and economical way of disposing of garbage, the Hotpoint Municipal Plan is the answer. All over the country, progressive municipal officials are dispensing with the old-fashioned, odorous, costly and unsightly "can and wagon" garbage collection system. The modern trend is to Hotpoint Disposalls.

The Hotpoint Municipal Plan provides a program by which your entire community can enjoy complete elimination of all garbage disposal problems. The Hotpoint Plan is based on documented experience and written specifically for municipal officials. A request from you will bring the complete story on how you can provide—

- A convenient, new and modern food-waste removal system.
- Health protection to the members of all families.
- Fly and rat pest reduction.
- Garbage collection cost reduction.
- More digester gas for use and sale.
- More digested sludge for fertilizer.
- Elimination of food-waste before it becomes garbage.
- Elimination of alley garbage can.
- Elimination of garbage collection problems.
- Elimination of garbage odors.
- True sanitation for your town.

And... it saves you money!

Write to Hotpoint Disposall Dept.

5600 West Taylor St., Chicago 44, Illinois, for all the facts



Hotpoint Inc.

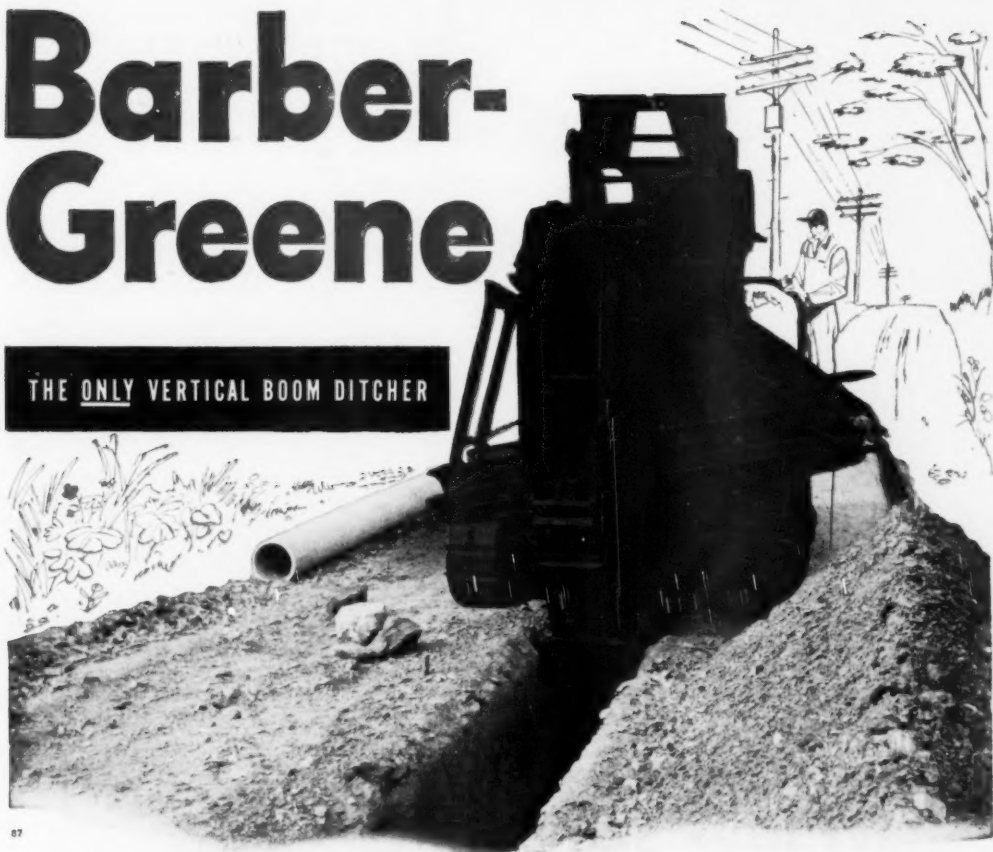
(A General Electric Affiliate)

5600 West Taylor Street, Chicago 44, Illinois

Thousands use our Readers' Service card to keep up to date... do you?

Barber-Greene

THE ONLY VERTICAL BOOM DITCHER



digs clean—leaves no ramp • discharges on either side

Here's an exclusive ditcher feature that saves a lot of hand labor. The Barber-Greene's vertical boom digs straight down, right up to walks, foundations, underground piping and mains, etc. There's no ramp to run up digging costs.

Closely spaced, self-cleaning "kick out" buckets, traveling at high rate of speed, cut like a milling machine . . . leave a clean-walled trench. It's this efficient operating principle that gets the B-G Ditcher through materials as tough

as coral rock — down to 8 feet, 3 inches; widths up to 24 inches. Feeding speeds range from 10 inches to 8 feet per minute.

An adjustable spoils conveyor discharges on either side, and the automatic overload release protects both the machine and hidden objects.

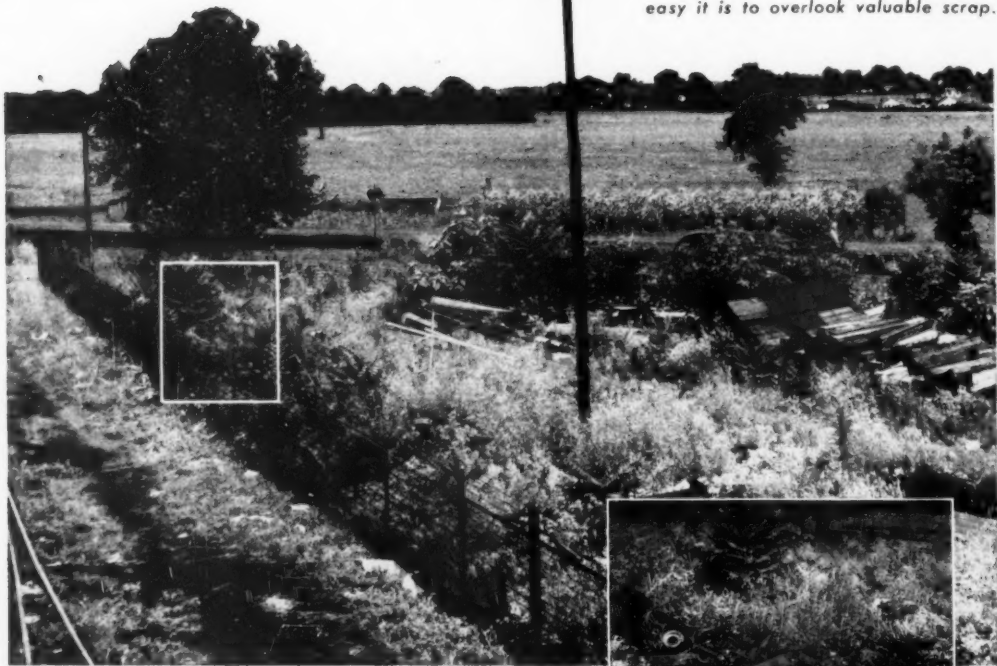
Find out how this compact, maneuverable, easily controlled unit can keep your trenching costs down . . . and what varied work it will perform.

BARBER-GREENE COMPANY

AURORA, ILLINOIS, U. S. A.

Get full details of this month's new products . . . mail your Readers' Service card today.

These pictures of a storage yard show how easy it is to overlook valuable scrap.



You lose when scrap plays Hide-and-Seek

It doesn't look as though much scrap is in this storage yard, does it? But let's look closer, beneath the weeds. Tons of valuable iron and steel scrap are hidden here.

Could this be true of *your* storage yard?

If so, there are two good reasons why you should gather up this worn-out iron and steel equipment and call your scrap dealer *immediately*. Most important, steel mills are in desperate need of scrap. Unless much more scrap is turned in there is danger

that steel production may be cut in the months to come. And our nation's defense program may suffer through the steel shortage.

The high price of scrap is another good reason. You get more actual cash by selling now.

Take these two simple steps: Survey your shops and storage yards for worn-out iron and steel parts and equipment; then call your local scrap dealer. But don't stop here. Make plans now to establish a regular scrap collection program in your city.



ARMCO STEEL CORPORATION

1942 CURTIS STREET, MIDDLETOWN, OHIO • PLANTS AND SALES OFFICES FROM COAST TO COAST • EXPORT: THE ARMCO INTERNATIONAL CORPORATION



Now's the time to mail this month's Readers' Service card.

more **than 1600** cities, towns, contractors
now use . . .



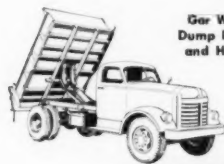
Gar Wood **LOAD-PACKERS**

- To Cut Refuse Collection Costs
- To Improve Public Health

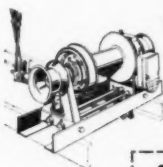
Gar Wood Load-Packers have reduced refuse collection costs for more than 1600 users (including cities of all sizes and small towns). Not only are costs cut to a minimum . . . but the Load-Packer has also proved best for promoting municipal cleanliness and public health.

Among the important features of the Load-

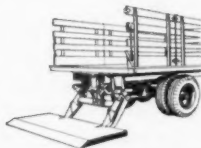
Packer are: (1) faster loading, (2) completely enclosed body, (3) low loading hopper, (4) push button operation, (5) compression loading for maximum loads and fewer trips, (6) fast, clean dumping, (7) reduced maintenance. See for yourself why the Load-Packer is by far the most popular refuse collection unit. Use the coupon below . . . today.



Gar Wood
Dump Bodies
and Hoists



Gar Wood
Winches



Gar Wood
Elevating
End-Gate

52-2



GAR WOOD INDUSTRIES, INC.

Wayne Division • EXECUTIVE OFFICES, WAYNE, MICHIGAN

TRUCK EQUIPMENT: Dump Truck Bodies & Hoists, Winches & Cranes, Refuse Collection Bodies, Elevating End-Gates. CONSTRUCTION EQUIPMENT: Excavators, Scrapers, Dozers, Ditchers, Spreaders, Finegraders, Truck-Mounted Road Graders

Gar Wood Industries, Inc.

Executive Offices, Wayne, Michigan

Please send me Bulletin M60 explaining the many advantages of Gar Wood Load-Packers. Also bulletins on other items checked:

☐ Dump Bodies

☐ Elevating End-Gate

☐ Winches

Name _____

Title _____

Address _____

It's a fact . . . our handy Readers' Service card is the easy way to get new catalogs.

HERE'S MORE HORSEPOWER TO YOU!



... with HAMILTON'S exclusive rotary exhaust valving

Combustion is *better* because 40% more air is trapped in the cylinder ... squeezed into the fuel spray cone as piston reaches top dead center.

You can burn *heavier* fuel oil.

Rating is the *same* on either diesel fuel or gas.

Exhaust is *cleaner, cooler* on the heaviest fuel.

You get **MORE HORSEPOWER** per cylinder size and speed than in any equivalent engine—without increase in pressure or in temperature.

Write for Bulletin 215A951



Sturdy unit construction gives the Hamilton rotary exhaust valve long life, easy maintenance.



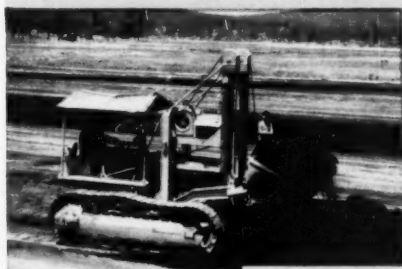
Lima-Hamilton Division
Baldwin-Lima-Hamilton Corporation
Hamilton, Ohio

BALDWIN-LIMA-HAMILTON

Need more facts about advertised products? Mail your Readers' Service card now.



Excavating to bring a street to grade, this T4 TRAXCAVATOR takes full cubic yard bites . . . spins and hauls in fifth gear . . . dumps quickly and accurately into the hauling unit . . . races back for another cost-cutting load. The T4 is owned by the City of Yorkton, Saskatchewan.



Loading Road Material from Windrow.



Snow Removal in Town or Country.

MAKE THE MOST OF MULTI-PURPOSE TRAXCAVATORS!

● Don't overlook *any* task where a TRAXCAVATOR'S tax-saving advantages can be put to work!

In any material — tough soils, gravel, shale, cinders, snow . . . on any job — digging, grading, loading, stockpiling, snow removal — one-man TRAXCAVATOR crews perform their many cost-and-time saving duties, leaving limited-purpose machines to their specialized tasks!

TRAXCAVATORS are engineered specifically for use with "Caterpillar" Diesel Tractors . . . matching their surefooted teammates in power, capacity, and rugged durability . . . matching for greater economy and higher work-speed.

Ask your "Caterpillar" Dealer to show you a multi-purpose TRAXCAVATOR at work in the public's service . . . and how a TRAXCAVATOR's tax-saving advantages can serve you.

TRACKSON COMPANY, Milwaukee 1, Wisconsin
A Subsidiary of Caterpillar Tractor Co.

TRACKSON

TRAXCAVATORS®
PIPE LAYERS
TRACLOADERS
EARTH AUGER

BETTER BE SAFE THAN SORRY WHEN YOU'RE MOVING GAS OR AIR

- ☐ Choice of Rotary or Centrifugal
- ☐ Capacity matched to the job
- ☐ Easy accessibility
- ☐ Ruggedness
- ☐ Ease of installation
- ☐ Ability to handle overloads
- ☐ Long-time durability
- ☐ Freedom from breakdowns
- ☐ Low maintenance costs
- ☐ Engineering assistance
- ☐ Proved reputation of maker
- ☐ Customer satisfaction

Battery of four 3-Stage Centrifugal Blowers in metropolitan sewage treatment plant. Capacity of each, 15,000 cfm.



You can't afford to take chances when the successful operation of a sewage treatment plant depends upon maintained performance of blowers or gas pumps. So, we suggest that you check carefully the above factors before you make your final decision.

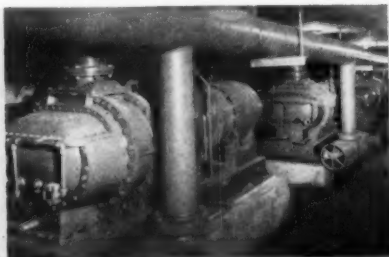
If you are faced with a choice between Centrifugals or Rotary Positives, remember that only Roots-Connorsville makes both types. From our exclusive dual-ability line, with capacities from 100 cfm to 100,000 cfm or higher, at moderate pressures, most buyers can find a unit closely matched to their specific needs.

We'd like to remind you, too, that for almost a century we've built only blowers and related equipment. Our products have a long, happy record for outstanding, reliable, economical performance in large and small sewage treatment plants and waterworks. Our vast reservoir of experience is at your service, to meet any problem of handling gas or air.

ROOTS-CONNORSVILLE BLOWER CORPORATION
524 Poplar Avenue, Connorsville, Indiana

ROTARY

In the plant illustrated above, three R-C Gas Pumps are used for boosting pressure from gas storage to engines.



Reg. U. S. Pat. Off.

ROOTS-CONNORSVILLE

ONE OF THE DRESSER INDUSTRIES



Get full details of this month's new products . . . mail your *Readers' Service* card today.

PUBLIC WORKS



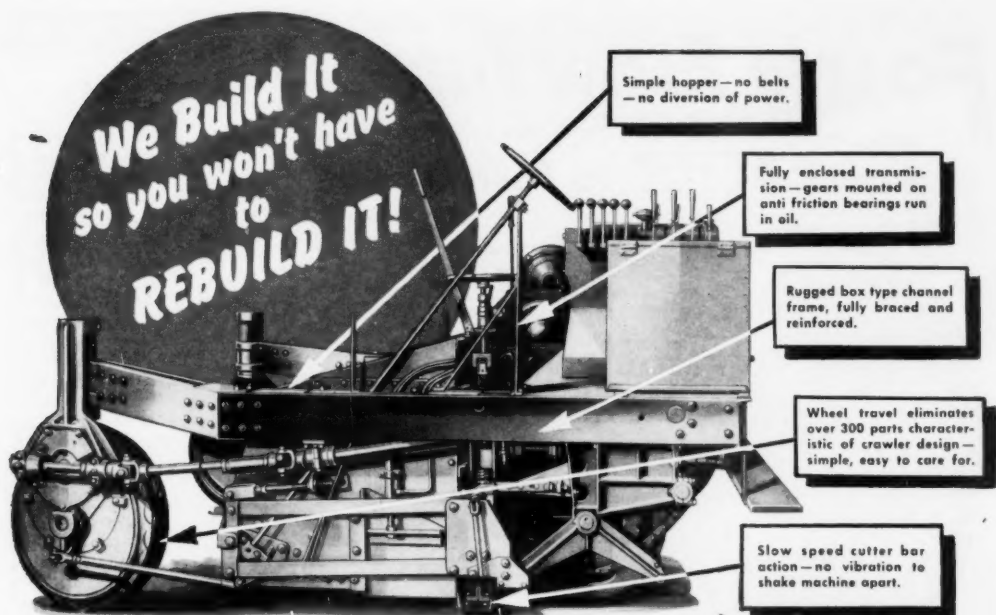
LEADERS IN PUBLIC WORKS



James J. Doland is well and favorably known as Professor of Hydraulic Engineering at the University of Illinois, where he has served for 25 years, and as a consulting engineer on airports, drainage and flood damage. Along with Harold Babbitt, he is co-author of *Water Supply Engineering*, one of the very fine books in that field. He was one of the authors of *Low Dams*, published by the National Resources Planning Board, probably one of the best texts in this line ever produced. He has another book, *Water Power*, now in process.

His degrees are almost too numerous to mention: BS (CE) at Colorado; CE at Colorado; MS at Illinois; and DSc (Hon) from St. John's. He is a member of the ASCE, the AICE, the American Geophysical Union and the American Association for the Advancement of Science. He has served as consultant on many projects, including the National Resources Planning Board; Upper Mississippi and Ohio Project Review Committee; air bases in the Caribbean and in Guiana; and for the Sanitary Corps on the ASTP program. He designed and supervised building the University of Illinois airport, shown in the background on the cover. He is married and his hobbies are photography and gardening.

A good many people feel with us that Jimmie Doland represents the ideal type of professor and engineer.



"I don't have to rebuild the Adnun!" That's one of the things that Adnun Owners who have owned other makes of Black Top Pavers tell us.

Adnun Pavers are ruggedly built. They are heavy of frame, fully reinforced. Simple design makes upkeep easy. There are no extra mechanisms, conveyor belts or extra gears. The main transmission is fully enclosed. Gears are mounted on anti friction bearings and run in oil. Screed action is slow speed and there is nothing to create excessive vibration and shake the machine apart. These things materially reduce "down" time and increase output.

Ask for the booklet, "11 Basic Things..." —it will give you some new thinking on Black Top Pavers.

THE FOOTE COMPANY, INC.

Subsidiary of Blaw-Knox Co.

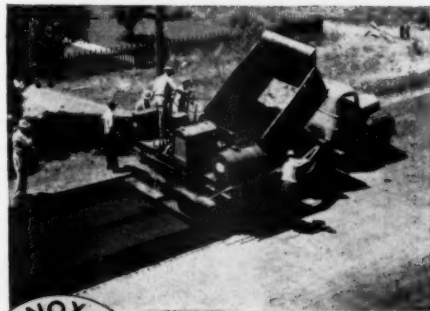
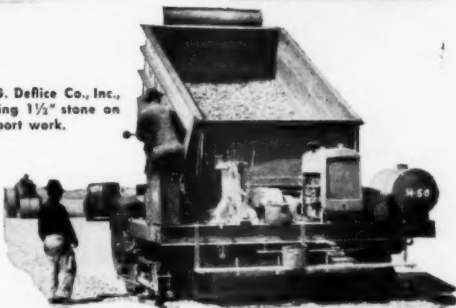
1954 State Street

Nunda, New York

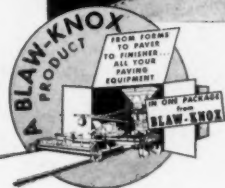
ADNUN
TRADE MARK REGISTERED
BLACK TOP PAVER

It's a fact . . . our handy Readers' Service card is the easy way to get new catalogs.

L. G. Deffice Co., Inc.,
laying 1½" stone on
airport work.



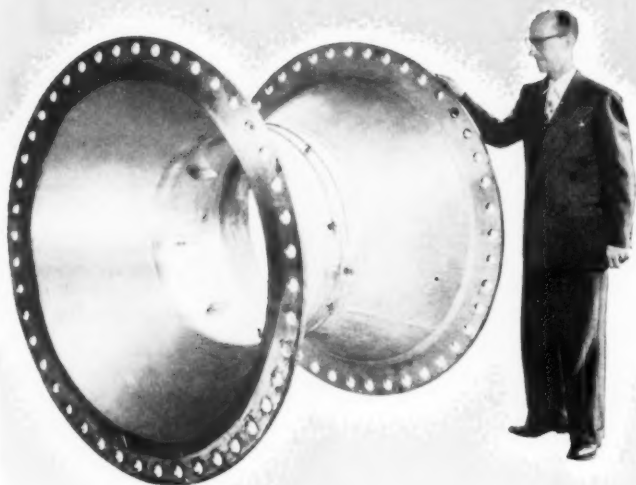
An Adnun laying 13 ft.
road in the West.



FOSTER FLOW TUBES

(Gentile Patents)

Are **EASIER** to Install



This 48" Foster Type D Flow Tube, of lightweight fabricated steel construction for measuring flow of air in the discharge line of a reactor air system, flanged for 125 \pm , is only 48" in length between flanges and weighs only 1350 lbs.—many feet shorter and several thousand pounds lighter than a conventional venturi.

In addition to being considerably easier to handle, the Flow Tube takes up but little space, and needs no straight entering run for normal accuracy, except before and after valves in which case eight diameters are required upstream and five diameters downstream. This means that the Flow Tube can be installed without expensive vaults or housing in any readily accessible point where flow conditions are reasonably steady.

This Flow Tube, one of many for top priority defense projects, was designed to handle 29,300 SCFM at 10.12 PSIA at 238° F with a maximum head loss of 2" H₂O and with an accuracy within $\pm 1\%$ of the calibration curve furnished with it.

Foster Flow Tubes are made for a wide range of services metering the flow of liquids and wet or dry gases. They are available in all commercial pipe sizes, with screwed or flanged connections, bell and spigot, or welding ends, and of any materials required by the service. For further information on Flow Tubes, ask for Bulletin FT-101; and if you would like specific recommendations, please give us processing and installation details of your metering requirements.

FOSTER ENGINEERING

Company

835 Lehigh Avenue • Union, N. J.

PRESSURE REGULATORS...RELIEF AND BACK PRESSURE VALVES...CUSHION CHECK VALVES
...ALTITUDE VALVES...FAN ENGINE REGULATORS...PUMP GOVERNORS...TEMPERATURE
REGULATORS...FLOAT AND LEVER BALANCED VALVES...NON-RETURN VALVES...VACUUM
REGULATORS OR BREAKERS...STRAINERS...SIRENS...SAFETY VALVES...FLOW TUBES

Now's the time to mail this month's Readers' Service card.

BOOKS IN BRIEF

EMERGENCY MEDICAL AND HEALTH PREPAREDNESS.

This is a special publication, wholly on civil defense problems of the Department of Health of the State of New Jersey, *Public Health News*, Vol. 32, No. 7, issued July, 1951. Chapter 1 is devoted to general information; Chapter 2 covers organization and the functions of each division—state, district and area, and local. The third chapter is on personnel and training for all personnel required by a health department in the discharge of its civil defense duties. Chapters 4 and 5 cover the medical phases of the problem — radiological chemistry, first aid, hospitalization and emergency medical services. Health services are covered in Chapter 6, with consideration given to biological and psychological defense, supplies, records, registration and allied responsibilities. The final chapter covers sanitation, including food and milk, water and sewage, rodents and insects. Address the Department of Health, State of New Jersey, Trenton, N. J.

RADIOACTIVE WASTES

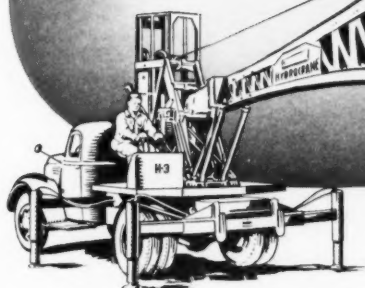
In the expectation that the greater part of phosphorus-32 and iodine-131 isotopes will be by discharge into sewers, this handbook considers permissible concentrations from the point of view of safety to the community and to sewage plant personnel. Practical and easily followed rules are given for specified isotopes. Order from Government Printing Office, National Bureau of Standards Handbook 49; 10 cents.

RADIOLOGICAL HEALTH AND CIVIL DEFENSE.

Under the sponsorship of the Engineering and Industrial Experiment Station of the College of Engineering of the University of Florida, Gainesville, the Fourth National Public Health Engineering Conference was held last spring. The 20 papers presented at that conference have been published as Bulletin Series No. 48.

Four papers are grouped under the general heading of "Basic Principles of Radiation." Following this are 10 papers on radiological health, covering 48 pages of the size of this one. The final paper in this

Here's a Boom That **REACHES** For Extra Jobs



The all-hydraulic Bucyrus-Erie 3-ton Hydrocrane with telescoping boom reaches into windows and box cars . . . over fences . . . under beams and overhanging branches . . . between wires and rafters — without moving crane an inch! Boom extends and retracts a distance of eight feet.

The outstanding advantages of telescoping boom plus precision hydraulic control and high speed travel combine to make the Hydrocrane ideal for setting sewer, water and gas pipe . . . digging manholes . . . emergency pipeline repair . . . moving sidewalk slabs . . . erecting lamp posts and utility poles . . . cleaning catch basins . . . dozens of

lifting, digging, and material handling jobs.

In addition, crane can be quickly converted to hoe front-end in the field for trenching or digging transformer and meter pits . . . miscellaneous excavating. Conversion has actually been made in as little as four man-hours. See your Hydrocrane distributor on complete details.

160H52

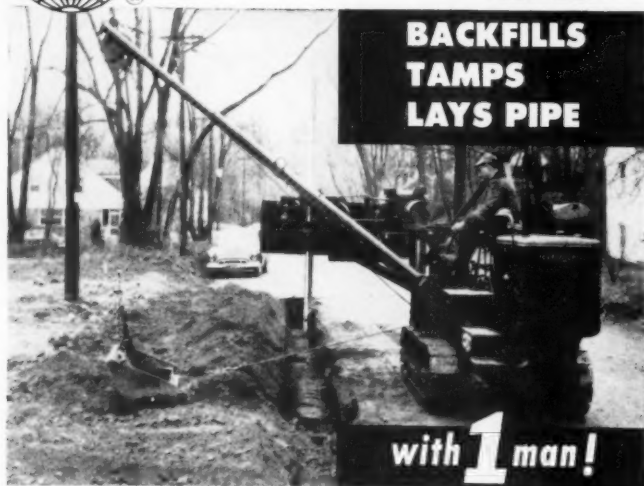
Here is the Hydrocrane in action. Every work function fully hydraulic — boom hoist and swing, load hoist, boom telescope, outrigger set and retract, bucket close.



Need more facts about advertised products? Mail your Readers' Service card now.



THE CLEVELAND 80



Tops for water, gas, sewer, telephone and power lines — leak clamp openings — highway and airport drainage . . .

LOOK AT THESE ADVANTAGES

- One-man operation — cuts labor cost, cuts need for air and hand tools.
- Fills — as it tamps — as it travels — 24 speeds in either direction.
- Backfills from either side of trench — fast, clean and smooth.
- Tamps from side or straddling trench — delivers 380 foot-lb. blow 45 times each minute.
- Lays pipe—pulls sheathing—sets valves—handles headache ball, etc.
- More maneuverable — fewer traffic hazards — better public relations.

For complete information on the CLEVELAND 80 see your local distributor or write for this fully illustrated folder of facts and specifications.



THE CLEVELAND TRENCHER CO.

20100 ST. CLAIR AVENUE

CLEVELAND 17, OHIO

Thousands use our Readers' Service card to keep up to date . . . do you?

Filling—tamping—traveling simultaneously.



Laying 8" main and pulling crossings.



No jockeying into traffic lanes here!

series was "Problems of Control and Disposal of Radioactive Waste Materials" by Roy J. Morton. Under the heading of "Civil Defense" are grouped six papers covering the medical aspects of defense, decontamination procedures, coordination between the various agencies, mutual aid and mobile support, defense against biological warfare, and chemical warfare defense problems. Write the Engineering and Experiment Station at the above address.

AWWA SPECS

Tentative standard specifications for reinforced concrete water pipe, non-cylinder type, not prestressed, have been issued by the American Water Works Association, 521 Fifth Ave., New York 17, N. Y. In booklet form, 20 cents each.

FLUORIDATION BIBLIOGRAPHY

The Municipal Reference Library, 1705 Water Board Bldg., Detroit 26, Mich., has compiled a bibliography on the fluoridation of public water supplies. This is 13 pages long, and appears to be very complete. Copies will be sent free to interested officials as long as they are available. Write the Library.

FLORIDA WATERS

This report summarizes a study to determine the chemical characteristics of the fresh waters of Florida. Prepared by Dr. A. P. Black of the University of Florida, and his colleague, Prof. Eugene Brown, the report contains 8 chapters, of which the following are technical: Topography of Florida, geology, quality of water, strontium in Florida waters, water treatment in Florida and tables of analyses. The latter cover some 92 pages and give information on wells, lakes, rivers and creeks and springs. This is Water Survey & Research Paper No. 6 and is published by Division of Water Survey & Research, State Board of Conservation, Tallahassee, Fla.

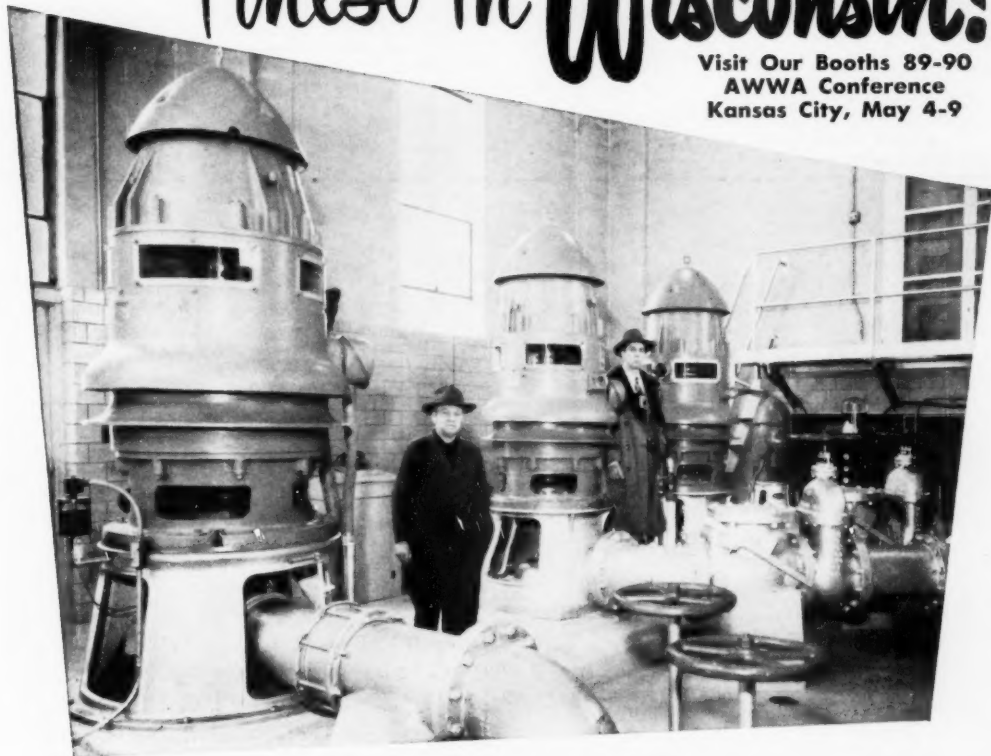
PENNSYLVANIA WATERS

This 170-page book contains data on the chemical quality of the surface waters of Pennsylvania. Included are temperature, pH, color, sp. conductance, silica, iron, Ca., Mg., K., Na., bicarbonate, sulfate, Cl., F, nitrate, dissolved solids and hardness. Pennsylvania Dep't. of Commerce, Harrisburg, Pa.

ONE OF
THE

Finest In* Wisconsin!

Visit Our Booths 89-90
AWWA Conference
Kansas City, May 4-9



Layne now offers two new folders which fully describe the Layne Oil and Layne water lubricated pumps. Copies will be sent on request. No obligation.

Layne

WATER WELLS

VERTICAL TURBINE PUMPS
WATER TREATMENT

for the city of wauwatosa

* Layne points with pride to a recent deep well and a four vertical turbine pump installation for the city of Wauwatosa, Wisconsin. From an overall capacity, control flexibility, high efficiency, smoothness of operation and modern engineering, this is one of the very finest water supply plants in the state. The 1750 foot deep well, cement grouted from top to bottom, produces 1650 gallons of water per minute against a dynamic head of 145 feet. All water for the city of Wauwatosa is 100 percent from Layne pumps.

This installation is typical of Layne's all inclusive services. Everything from the original test borings to the well drilling, sand screen and pumps and motors, was handled complete by Layne's own crews operating under the direct supervision of Layne engineers. It is such splendid services and outstanding results that Layne and Layne alone in the Nation, is in a position to offer cities, factories, mills and plants of all kinds, whether the need is for a single unit or for many.

For late catalogs, bulletins etc., address

LAYNE & BOWLER, INC.
GENERAL OFFICES, MEMPHIS 8, TENN.

Get full details of this month's new products . . . mail your Readers' Service card today.

... on every job you set new standards of
compressor operating efficiency with....

DAVEY

Davey Model 160 Diesel in service of Ray
D. Baker Contractor, Inc., Detroit ... on
Consumers Power Co. job, Royal Oak, Mich. ➡



Davey Model 105 trailer on
water line job in Kent, Ohio.

TODAY—more than ever before—efficient
equipment holds the sure key to successful
construction and maintenance work.

That's why it will pay you to find out the facts
about Davey before you buy any compressor.

Every Davey Compressor is equipped with
Permanent Peak Efficiency lifetime valves.
These never carbon or foul... do not require
cleaning or replacement... keep tools oper-
ating at full capacity.

A-5105

Davey Field Service Unit owned by Borough
of Manhattan (N.Y.) contains complete re-
pair and maintenance equipment. Model 105
Davey "Auto-Air" Compressor and 300
ampere, 8 k.w., combination welding and
power generator are among main items.



DAVEY

*pioneers of
air-cooled air*

DAVEY COMPRESSOR CO. • KENT, OHIO

It's a fact... our handy Readers' Service card is the easy way to get new catalogs.

25 minutes of action, in 16mm. color and sound,
showing the Model "40" Sweeper on a wide variety
of municipal and industrial jobs.

AUSTIN-WESTERN

presents the
MODEL "40" MOTOR SWEEPER
in
*"All Around
the Town"*

Pacemaker in performance, the Model "40" Sweeper is the culmination of 30 years of experience in designing and building motor sweepers. Model "40" sweeping is low-cost sweeping. Every mile of clean-swept street and gutter behind a Model "40" represents substantial savings in dollars and cents—savings over antiquated hand methods of pan and broom—over less modern types of sweepers with cumbersome and costly elevators and conveyors. Fast, clean-sweeping, superbly maneuverable, the Model "40" answers the problems of state and municipal cleanliness in parks, streets, alleys, and on highways. From end to end it's built to do a cleaner, better job than any sweeper ever manufactured.

The new sound-and-color movie "All Around the Town" tells the whole story. Your nearby Austin-Western distributor will be glad to arrange a showing in your community.

AUSTIN-WESTERN COMPANY · Subsidiary of Baldwin-Lima-Hamilton Corporation · AURORA, ILLINOIS, U.S.A.

Austin Western



SINCE 1927 - AUSTIN

CONSTRUCTION EQUIPMENT

NO WORRY OVER LOW FLOW CAPACITY



...when you protect pipe lines
with **BITUMASTIC® 70-B ENAMEL**



PPIPE LINES DON'T "SHRINK" when interior surfaces are coated with a spun lining of Bitumastic 70-B Enamel . . . because this durable enamel prevents rust, corrosion, incrustation and tuberculation.

When there's no "shrinkage" of inside diameter, there's no loss of valuable line capacity. Your pumping costs are reduced . . . your pipe line's coefficient of flow stays high. It's unnecessary to spend money for over-sized pipe in order to allow for anticipated loss in flow capacity.

Further, with a flow capacity you

can count on, there's no gambling or guessing as to the size of pipe you specify. You select pipe for your water lines solely on the basis of desired capacity.

Bitumastic 70-B Enamel is equally effective in protecting exterior surfaces of pipe lines. It prevents pitting and leakage caused by soil corrosion.

Protect your community's steel pipe lines, inside and out, by specifying Bitumastic 70-B Enamel. Our representative will be glad to assist you in preparing your specifications. If you wish, our Contract Department will handle your coating job for you at the job site. Write for complete information.



KOPPERS COMPANY, INC., Tar Products Division, Dept. 455-T, Pittsburgh 19, Pa.

DISTRICT OFFICES: BOSTON, CHICAGO, LOS ANGELES, NEW YORK, PITTSBURGH, AND WOODWARD, ALA.

Need more facts about advertised products? Mail your Readers' Service card now.



Keep This Angle in Mind

... that when you want to move big volumes of sewage or storm water economically, your best bet is Fairbanks-Morse *Angleflow* Pumps. Designed for maximum plant efficiencies where large quantities must be pumped against moderate heads, these dependable pumps give you a new high in service ... a new low in operating and

maintenance costs. Wide, unobstructed passages through impeller and volute make them especially suitable for handling debris-filled water. Sizes range from 8 to 54 inches ... capacities up to 80,000 g.p.m. For complete information see your local Fairbanks-Morse Branch or write Fairbanks, Morse & Co., 600 S. Michigan Ave., Chicago 5, Ill.

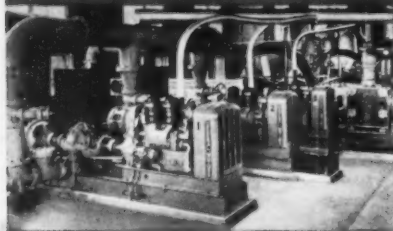


FAIRBANKS-MORSE,

a name worth remembering

PUMPS • DIESEL LOCOMOTIVES AND ENGINES • ELECTRICAL MACHINERY • SCALES
HOME WATER SERVICE EQUIPMENT • RAIL CARS • FARM MACHINERY • MAGNETOS

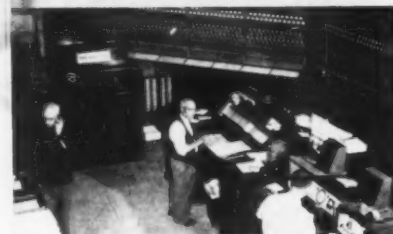
READY TO SERVE IN CIVIL DEFENSE



Water Department of Pontiac, Michigan, has for standby service three 6-cylinder GM Diesel engines connected to pumps with a total capacity of 378,000 gallons per hour.



Chicago, Philadelphia, Houston and other cities depend on GM Diesel-powered fireboats for waterfront and harbor protection. These boats, with 6-, to 12-thousand GPM capacity, are equipped to pump into city mains in emergency.



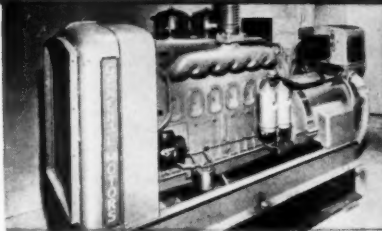
This important "nerve center" serves 3700 fire alarm boxes in the Borough of Queens, New York City. Two 60 KW DC GM Diesel generators provide standby power.

TO ASSURE standby power for water supply, lighting and communication in emergencies, many of America's cities, public utilities, defense industries, hospitals, airports and radio stations rely on General Motors 2-cycle Diesel power. Pictured here are a few of the ways these high-powered portable Diesels help safeguard vital public services.

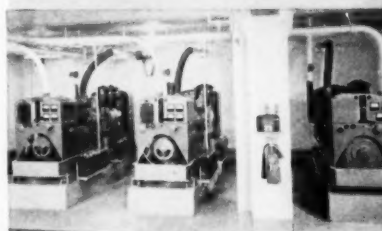


General Motors Diesel engines are built in a wide range of models to meet all types of power needs—Series 71 engines, 2 to 24 cylinders, 32 to 800 H.P. and 6-cylinder 110 engine, 275 H.P. For specific information on how these compact, portable Diesels can fit into your Civil Defense plans, write, wire or phone.

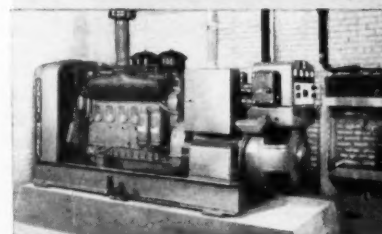
*Diesel Brawn
without the Bulk*



Radio Station WMPS, Memphis, Tennessee, installed this 60 KW GM Series 71 Diesel generating set for emergency standby use. This auxiliary picks up full broadcast load within 3 seconds if power supply drops below a critical point.



Telegraph Office has GM Diesel standby electric generators for emergency service. Similar sets of from 20 to 200 KW can take up normal voltage load of hospitals, defense plants, public buildings and small communities.



Over 800 U. S. Telephone Exchanges are equipped with GM Diesel Electric generator sets, providing a reliable source of emergency power to insure communications.

DETROIT DIESEL ENGINE DIVISION

SINGLE ENGINES... Up to 275 H.P. DETROIT 28, MICHIGAN MULTIPLE UNITS... Up to 800 H.P.

GENERAL MOTORS





**DEPENDABILITY AND PROVEN WORTH
IN THE MUNICIPAL WATERWORKS FIELD**

Communities from villages to cities have found that McDonald Waterworks products serve faithfully with a minimum of service. Here are two cast iron Service Boxes: top, the E-5601 "Arch Pattern", extended lengths from 2 to 8 feet, and bottom, the E-5614 Minneapolis Pattern, (cutaway) extended lengths from 2 to 8½ feet. Write us for particulars concerning our full Waterworks Line.

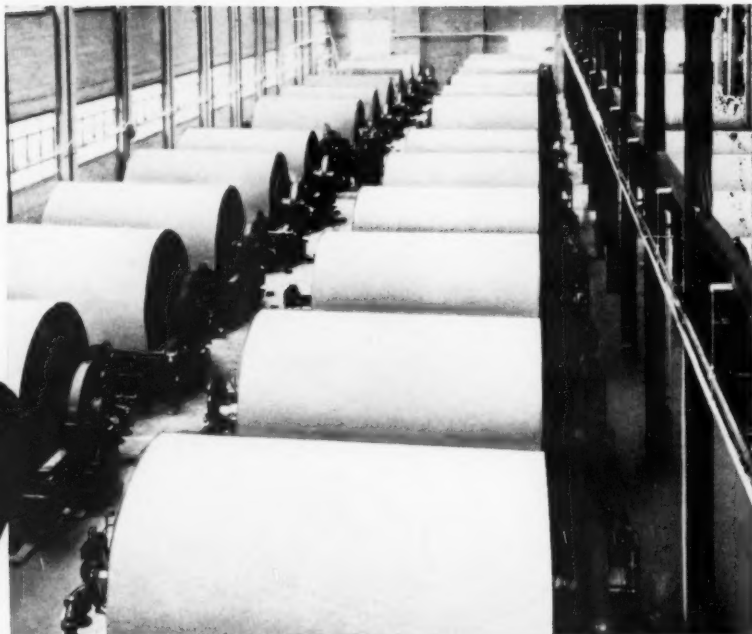
A. Y. McDONALD MFG. CO., Dubuque, Iowa

BRASS GOODS • PUMPS • OIL EQUIPMENT



**See
General
American
for
CREATIVE
FILTER
ENGINEERING**

**Designed
to do
your job
best!**



66 Conkey Sludge Filters now installed in one plant of Chicago Sanitary District

The West-Southwest Treatment Works of the Chicago Sanitary District is the largest sewage treatment plant in the world. Here, the huge volume of industrial and residential waste from the heavily populated metropolitan area has presented sewage engineers with an unparalleled challenge. Progressively, the Chicago Sanitary District has met that challenge. Starting twenty years ago with installations of continuous vacuum filters for activated sludge, Sanitary District engineers have developed the most exacting specifications and rigid requirements for filter designs and performance... culminating in the installation of 66 Conkey Rotary Drum Vacuum Filters for this largest single installation in the sewage field.

These Conkey units incorporate:

Polystyrene plastic cloth backing drainage plates for long cloth life and low maintenance.

Flotating cake discharge scraper.

Protective coatings for filter components.

—and other superior design and construction features.

For equivalent Conkey design and fabrication for your filter installation, write General American. Ask for bulletin No. 100 or for a consultation with one of our engineers.

Other General American Equipment:

Turbo-Mixers, Evaporators,
Dewaterers, Dryers,
Towers, Tanks, Bins,
Pressure Vessels

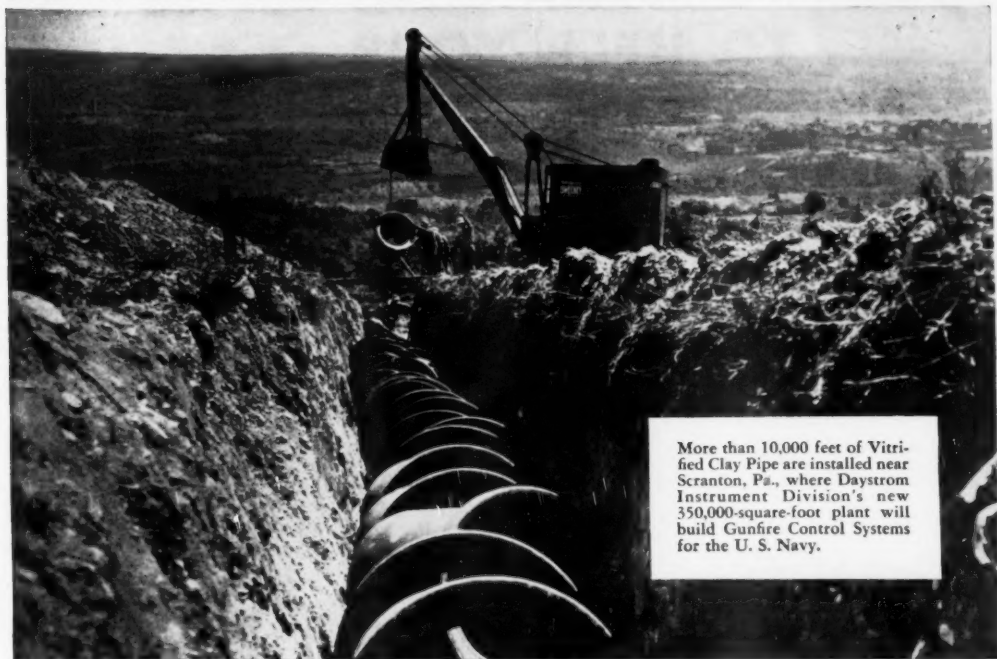
OFFICES IN ALL PRINCIPAL CITIES



Process Equipment Division GENERAL AMERICAN Transportation Corporation

Sales Office: 10 East 49th St., New York 17, N. Y.
General Offices: 135 S. La Salle St., Chicago 90, Ill.
In Canada: Canadian Locomotive Co., Ltd., Kingston, Ont.

Now's the time to mail this month's Readers' Service card.

CLAY PIPE—ESSENTIAL ★ ECONOMICAL ★ EVERLASTING

More than 10,000 feet of Vitrified Clay Pipe are installed near Scranton, Pa., where Daystrom Instrument Division's new 350,000-square-foot plant will build Gunfire Control Systems for the U. S. Navy.

EYNON, PA., EXPANDS SEWERAGE as Daystrom Builds Gunfire Control Plant

In peacetime, in preparation for defense, or in wartime — Vitrified Clay Pipe is the *dependable* material that serves America's expanding communities. It's the *only* readily available sewerage material that has proven its worth for municipal systems, housing projects, and industrial wastes through actual long-term performance in the ground.

Clay Pipe is safe because it's chemically inert — proof against the sewer gases and destructive chemical action that you've seen at work on so many non-clay materials. It stays round, firm, and smooth . . . protects the reputation of every man

concerned with the job . . . because it always gives more service per dollar of investment. *It can't wear out!*

NATIONAL CLAY PIPE MANUFACTURERS, INC.

311 High Long Bldg., 5 E. Long St., Columbus 15, Ohio
100 N. LaSalle St., Rm. 2100, Chicago 2, Ill.
703 Ninth & Hill Bldg., Los Angeles 15, Calif.
206 Connally Bldg., Atlanta 3, Ga.

WHEREVER RELIABLE, PERFORMANCE-PROVED PIPE IS NEEDED, SPECIFICATIONS CALL FOR VITRIFIED CLAY

Hartford, N. Y. (Electronic Plant Expansion)	50,000 ft.
Needles, Calif. (Essential Ore)	87,000 ft.
Marion, N. C. (Municipal Sewerage)	32,000 ft.
Orlando, Fla. (Air Force Base)	74,000 ft.
Willow Springs, Ill. (Jet Engine Plant Expansion)	16,000 ft.
Morrisville, Pa. (New Steel Defense Plant)	300,000 ft.
Tucson, Ariz. (Air Force Base)	440,000 ft.
Bakersfield, Calif. (Air Force Base)	196,000 ft.

Vitrified

CLAY



PIPE

C-252-2

EQUIPMENT DATA TO HELP YOUR PUBLIC WORKS PROGRAM

The engineering information in these helpful catalogs will aid you in Engineering and Public Works programs. Just circle numbers you want on the coupon or write the manufacturer direct and mention **PUBLIC WORKS**.

NEW LISTINGS

What's Your Digging Problem?

Repair Work? Trenches? Footings?

33. At today's prices, hand digging means the job will be costly. You can dig through asphalt and macadam, work fast and efficiently even in cramped areas with the tractor mounted Sherman Power Digger. From one position you can reach to dig 10 feet behind tractor in 140° arc and to depth of 8 feet. For full details check the coupon. Sherman Products, Inc., Royal Oak, Mich.

Concrete Saw Cuts

Smooth, Straight Edges

83. When the sides of patches and trenches are sawed before breaking, a saving of 25% in removal costs is claimed. And the smooth, straight edges won't spall or crack after re-



placement material is poured. Investigate the exclusive features that give maximum economy to Clipper concrete saws. Full information from Clipper Mfg. Co., 2823 S. Warwick, Kansas City 8, Mo., or check the handy coupon.

Water Treatment Unit For Small Supplies

87. A complete-package water treatment unit to treat 5 to 100 gallons per minute is described in Bulletin 1845, issued by Inflico Inc., Box 3033, Tucson, Ariz. Unit softens, clarifies, sterilizes or removes organic matter, tastes or odors. Requires a minimum of attention. Investigate this unit whenever dependable treatment is needed for small domestic supplies. Check the coupon today.

Self-Propelled Sidewalk Paver Lays Up To 10 Ft. per Minute

52. Bulletin 52, released by Dotmar Industries, Inc., Kalamazoo, Mich., describes the Dotmar paver, which can lay up to 10 ft. per minute of walk when working with transit mix units. Paver is readily convertible to pave curb and gutter, or integral curb, gutter and walk. Get the 8-page illustrated bulletin for full data and reports from users. Just check the handy coupon.

New Air Raid Siren

Is Independently Powered

58. The new Chrysler Air Raid Siren, powered by a 180-hp engine to make it independent of vulnerable central power systems, may be remotely controlled if desired. Warning signal is said to be clearly recognized over a diameter of 8 miles. For complete information, specifications and availability write Marine and Industrial Engine Div., Chrysler Corp., 12210 E. Jefferson Ave., Detroit 31, Mich., or check the coupon.

Bulletin Helps Specify A.W.W.A. Valves

64. All the facts you need to know when designing, ordering or specifying A.W.W.A. valves will be found in Bulletin 106, issued by Kennedy Valve Mfg. Co., Elmira, N. Y. Detailed specifications are provided on the wide range of types, sizes, controls, accessories and connections available. Check the coupon to get this valuable reference material for your permanent file.

Permanent Street Signs Cut Maintenance Costs

218. Permanent cast aluminum street signs and markers of all types are described in a 20-page illustrated bulletin available from Lake Shore Markers, 654 W. 19th St., Erie, Pa. Get full information on these distinctive markers, available in plain or reflectorized finish, by checking the coupon.

Get Tough Blades and Cutting Edges For Your Construction Equipment

221. Controlled analysis steels used in Shunk blades and cutting edges for graders,

PUBLIC WORKS for April, 1952

scrappers, dozers, and snow plows means long life and wear resistance to give you more value for your maintenance dollar. Full data for ordering blades and scarifier teeth for standard and special equipment is available from Shunk Mfg. Co., Bucyrus, Ohio. Check the coupon today.

Truck-Mounted Crane Can Serve Many City Departments

92. Laying pipe and hydrants for the water department, lifting heavy equipment for the street department, and serving as a wrecker and tow unit for the police department are all jobs that can easily be handled by the Ashton Extension Boom Wrecker. Boom extends to a maximum length of 14 feet, lift from 0° to 80°. Illustrated bulletin from Ashton Power Wrecker Co., Inc., Detroit 16, Mich. Check the coupon for full data.

Self-Powered Paving Breaker Requires No Compressor

73. Low initial cost and low operating cost are big reasons why you should investigate the new, powerful Syntro gasoline paving breaker. No compressor, hose, cables or battery boxes are needed with these self-contained, heavy-duty machines. They will cut, bust, dig and tamp. Get details from Syntro Co., Dept. PW, Homer City, Pa. by checking the coupon.

Independent Bucket Action Gives Faster Loading

225. On all bulk materials handling jobs, the independent bucket action low load carrying position and ease of handling of the Trojan Loadster bring all-over economy. Several models available to suit your needs. Get all the details from Contractors Machinery Co., Batavia, N. Y., by checking the coupon.

Road Stabilization With Rock Salt

230. An interesting bulletin available from the Morton Salt Co., 120 So. La Salle St., Chicago, Ill., shows road-mix and plant-mix methods for stabilization of secondary roads and primary road bases with rock salt. Get your copy by checking the coupon.

MORE LISTINGS ON PAGES 38 TO 53

Clip

AND MAIL TODAY



READERS' SERVICE DEPT. PUBLIC WORKS MAGAZINE 310 East 45th Street, New York 17, N. Y.

Please send me the following literature listed in the Reader's Service Dept. of your April issue.

Booklets from pages 36 to 53:

20	21	23	24	25	28	29	30	33	34	35	36	37	38	39	40	41	43	44
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New Products, pages 148 to 151:

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4-16	4-17	4-18	4-19	4-20

Name

Occupation

Street

City

State

Design Data on the Circuline Sludge Collector

237. All the information you need for the design of circular settling tanks using the Link-Belt Circuline sludge collector will be found in 20-page Book No. 1982, published by Link-Belt Co., 2045 W. Hunting Park Ave., Philadelphia 40, Pa. Capacity tables, suggested sizes for all piping and design details are included. Check the coupon for your copy of this valuable booklet.

Cushioned Valves For Water Works

189. Golden-Anderson valves, including high pressure, low pressure, float control, pressure reducing, altitude control, surge relief and swing check valves, all feature specially designed air and water cushioned operation to prevent shock or hammer. Applications, available sizes and other details on all types will be found in Bulletin G-3, published by Golden-Anderson Valve Specialty Co., 2121 Keenan Bldg., Pittsburgh 22, Pa. Get this bulletin for your file by checking the coupon today.

Avoid Needless Digging With This Valve Box Locator

217. Convenience and accuracy are keynotes of the Aqua Valve Box locator described in a full-color folder offered by Aqua Survey and Instrument Co., 2518 Leslie Ave., Cincinnati 12, Ohio. Cobalt alloy steel dipping needle is factory-set for any geographic location. Periscope type mirror arrangement permits effortless top reading. Get full details by checking the coupon.

Investigate "Super Seal" For Blacktop Surfaces

222. Appearance and wearing qualities of all black top surfaces may be improved with an application of Super Seal, a weather and solvent-proof emulsion with a coal tar base. Be sure to investigate this easily-applied material that puts a smooth, tough finish on pavements and parking areas. Full details from Trover Driveway Service, 2157 South Park Ave., Buffalo 20, N. Y. Check the handy coupon.

Motor Driven Sewer Cleaner Does Faster Work

223. The O'Brien Root Master is especially designed to clean lateral lines 3" to 10" in diameter. Easily portable unit with motor or gasoline engine drive makes quick work of roots and other obstructions. Illustrated pamphlet from O'Brien Mfg. Co., 5662 Northwest Hwy., Chicago 30, Ill., available by checking the coupon.

How to Reflecticrete Your Old Street Signs

243. Street and warning signs can be given reflectivity for better legibility night and day when you use the Prismo Sign Kit. Work right in the field with brush or spray to give your old signs a new reflectorized surface. Get the details from Prismo Safety Corp., Huntington, Pa. by using the coupon.

Handbook of Castings For All Public Works Construction

220. Every type of construction casting needed by engineers and contractors in the public works field will be found in a 136-page catalog issued by Neenah Foundry Co., Neenah, Wis. Detailed illustrations and complete tables of dimensions will help the designer and materials buyer. Get your copy of this valuable catalog by checking the coupon today.

Optical Transit Available For Ordinary Surveying

242. A practical optical transit of the repetition type can be of real value to ordinary surveying crews. Setups are made more quickly with the optical plummet, and readings are positive and not affected by parallax. For full data on the Wild transit write to Henry Wild Surveying Instruments Supply Co., 26 Court St., Brooklyn 2, N. Y., or check the coupon.



**HELTZEL HELPS
CONSTRUCTION DOLLARS
GO FURTHER**

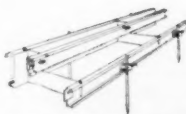


**SAVING
COST AND
TIME ON A HOSPITAL
CONSTRUCTION JOB**

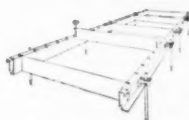
PROBLEM: To set a curb fast enough to be completed for a paving job scheduled on the following day. Available labor lacked special skills and experience.

ANSWER: Standard Heltzel dowel joint curb forms were used on the job with economy of time and money. Common labor on the job easily managed setting of the forms because Heltzel forms are designed with exclusive, practical aligning and staking devices.

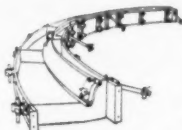
For more than 40 years Heltzel forms have been recognized as "tops" by leading contractors and engineers in the construction industry. This reputation results from Heltzel Engineers working closely to requirements of form setters and specification engineers. Heltzel Steel Forms, both standard and special, are illustrated and described in Bulletin L-20. Write for your copy and see where Heltzel can make your construction dollars go further.



COMBINED CURB AND GUTTER FORMS



HELTZEL SIDEWALK FORMS



HELTZEL RIGID RADIUS FORMS



HELTZEL FLEXIBLE FORMS



The Heltzel Steel Form & Iron Company

Construction Equipment Since 1910

WARREN, OHIO



Water Lines Under Pavements Easily Installed

247. With a Trojan pipe pusher and puller no resetting of grip is required, so the job goes twice as fast. Two models, for pipe up to 2" dia. Get full details by writing to the Trojan Mfg. Co., 1114 Race St., Troy, Ohio, or check the coupon.

Handbook Aids Selection Of Variable-Area Flow Meters

79. A new 50-page handbook has just been published by the Fischer & Porter Co., Hathers, Pa., to aid in the selection and sizing of variable-area flow meters. This illustrated handbook contains a complete description of variable-area meters, tubes and floats. Get your copy by checking the coupon.

Questions and Answers on Bromine For Pools

156. An interesting discussion of the advantages of bromine for swimming pool disin-

fection is available in question-and-answer form from the Halogen Supply Co., 4653 Lawrence Ave., Chicago 30, Ill. Subjects include effectiveness, handling, application and testing. Get this information by checking the coupon.

Highway Sprayer For Roadside Weed Control

132. Roadside improvement by use of brush killing sprays is easily accomplished with the Kromer highway sprayer. Trailer and skid-mounted units provide the gun type sprayers, pump, tank and extension hose. Full details in illustrated bulletin available from O. W. Kromer Co., Minneapolis 11, Minn., by checking the coupon.

"Speed-Lay" Pipe for Construction Jobs and Emergencies

109. Civil defense officials have discovered something that contractors have known for a long time—that the Albert "Speed-Lay" pipe system with factory packaged pipe and Vic-tual fittings and couplings can be quickly sub-

PUBLIC WORKS for April, 1952

stituted for damaged water lines or for water service on construction jobs. Full details in colorful 8-page bulletin from Albert Pipe and Supply Co., Inc., Berry & No. 13th St., Brooklyn 11, N. Y. Check the coupon for your copy.

Complete Data On Sludge Pumps

193. Sludge pumps, simplex, duplex, triplex and quadruplex, normal and heavy duty models, are described in Bulletin S48 issued by Marlow Pumps, Ridgewood, N. Y. Check the handy coupon for your free copy.

Latest Information

On effective Insecticides

198. Complete information on proper application and formulations of Chlorthane and other effective insecticides for fly and mosquito control is available from the Veliscol Corp., 330 E. Grand Ave., Chicago 11, Ill.

SEWERAGE AND WASTE TREATMENT

What You Should Know About

Trickling Filter Underdrains

20. Specifications for vitrified clay underdrain blocks conforming to ASTM standards, suggestions for layout and construction of trickling filter floors, dimensions of standard blocks, channel covers, angles and other fittings are available from the Trickling Filter Floor Institute, 46 Editor, Public Works, 310 E. 45th St., New York 17, N. Y. Check the coupon and we will forward your request.

Valuable Booklet on Porous

Diffuser Plates and Tubes

21. A helpful 20-page booklet published by the Norton Co. is a complete guide for the selection of porous media for installation in activated sludge plants. Full data for the designing engineer is provided by careful detailing of physical characteristics of plates and tubes. Maintenance of porous media also is discussed at some length. For your copy of Form 1246, write to the Norton Co., Dept. PW, Worcester 6, Mass., or use the coupon.

How Cities Clean Sewer Lines

From Street in One Operation

25. In a helpful 28-page handbook of sewer cleaning methods and equipment the makers of O.K. Champion sewer cleaners give full details of power and hand operated models. Also included are data on expansion buckets that take dirt from sewer to street in one operation, root cutters and other accessories. Get your copy by checking coupon. Champion Corp., 4752 Sheffield Ave., Hammond, Ind.

Packaged Sewage Treatment—

Just Right for Small Places

34. "Packaged" Sewage Treatment Plants specifically developed for small communities—100 to 3,000 population. Write for full description and actual operating data for this type of plant. Chicago Pump Co., 2348 Wolfram St., Chicago 18, Ill.

How to Make Better

Sewer Pipe Joints

37. How to make a better sewer pipe joint of cement—tight, minimizing root intrusion, better alignment of joint. Permits making joints in water-bearing trenches. General instructions issued by L. A. Weston Co., Dept. P.W., Adams, Mass.

A Handbook of Sewer Cleaning Equipment and Methods

46. A new, fully illustrated 40-page booklet shows every sewer cleaning operation with "Flexible" tools. Includes data on the fast and easily operated new SewerRodeR and full engineers' specifications for power bucket machines. For your copy write Flexible Sewer Rod Equipment Co., 9059 Venice Blvd., Los Angeles 34, Calif.

How You Can Dispose Of Sewage Solids

54. Nichols Herreshoff incinerator for complete disposal of sewage solids and industrial wastes—a new booklet illustrates and explains how this Nichols incinerator works. Pictures recent installations. Write Dept. PW, Nichols Engineering and Research Corp., 70 Pine St., New York 5, N. Y.



M&H BOOTH

A. W. W. A. CONVENTION EXHIBIT

KANSAS CITY AUDITORIUM—MAY 4-9, 1952

We look forward with keen pleasure to the A.W.W.A. Convention at Kansas City, Missouri, May 4-9, 1952. It is going to be a big meeting—and a good opportunity for us to meet old friends again and swap a few good stories.

Of course, if you should be interested in a wee bit of up-to-date information on Valves or Hydrants (just in case, of course), we might be able to satisfy your curiosity. But you will not need to "talk shop" to be welcome. Come by the M&H Booth.

M&H PRODUCTS

FOR WATER WORKS • FILTER PLANTS
INDUSTRY • SEWAGE DISPOSAL AND
FIRE PROTECTION

To order these helpful booklets check the coupon on page 36.

How to Dig Low Cost Trench Under All Conditions

81. The Barber-Greene Runabout ditcher features hydraulic control of crowding speed, independent of bucket line speed, to provide maximum digging efficiency under all soil conditions. One-man operation and mobility from job to job, result in trenching at the lowest cost. Get Bulletin 705-A now for full details on this money-saving machine. Barber-Greene, Aurora, Ill.

Helpful Design Data For Sewage Ejectors

81. The applications and advantages of pneumatic sewage ejectors are outlined in a new bulletin of the Blackburn Smith Mfg. Co., Inc., Hoboken, N. J. Included are piping diagrams for electrode and float switch controls plus dimensions and layouts for single and duplex systems. Get your copy by checking coupon.

Using Sewage Sludge Gas For Power Generation

90. Fairbanks-Morse dual fuel engines can operate on either sludge gas or oil to provide steady power output despite fluctuations in gas supply. Bulletins are available on several sizes to meet your needs. Write, giving exact requirements to Fairbanks, Morse & Co., Dept. PW, 600 So. Michigan Ave., Chicago 5, Ill. or use handy coupon.

End Root Problems With Root-Proof Sewers

107. Troubles caused by roots and corruptions in house connections can be eliminated by the use of root-proof Berrico sewer pipe. Full details on this smooth, waterproof, tight-sealing pipe available by checking the coupon, or write to the Brown Co. Dept. PW, 159 Causeway St., Boston 14, Mass.

Need Low-Cost Air For Sewage Treatment?

122. New 20-page booklet shows operating and construction features of Rotary Positive Blowers engineered to fit your needs. Air for activated sludge, water treatment, constant vacuum for filtering. Bulletin 22-23-B-13 gives details. Roots-Conserville Blower Corp., 510 Poplar Ave., Connerville, Ind.

Engineering Data on Digester Heating

128. An excellent 32-page bulletin covering all features of the PFT External Heater and Heat Exchanger unit discusses effective digester heating, size of heater and exchanger, space requirements, building heating, and related items. Curves and tables provide full data for the designer. Requests for this comprehensive bulletin, No. 235-25, must be sent on business letterhead. Pacific Flush Tank Co., 4241 Ravenswood Ave., Chicago 13, Ill.

Low Cost Power From Dual Fuel Engines

154. Operating on the Diesel cycle, burning either oil or gas, the Worthington Supercharged Dual Fuel Diesels give high economies by running on the cheapest fuel available. Get complete data from Worthington Pump & Machinery Corp., Dept. PW, Harrison, N. J.

Data Offered On Mixed Flow Pumps

201. Data on the complete line of Worthington Mixilo pumps of the two-vane, non-clogging sewage type is offered in 16-page bulletin W-317-H16. Salient features are outlined, typical sections, performance curves, and general data for five types are included. Helpful charts aid shafting selection. Copies available by using coupon or from Worthington Pump and Machinery Corp., Harrison, N. J.

How Vacuum Filters Help Your Sewage Sludge Disposal

209. Applications of the Conkey sludge filter to all types of sewage sludge are described in Bulletin 100. Tables show filter sizes, weights, and give anticipated average results. Use the coupon to order your copy. General American Transportation Corp., Process Equip. Div., New York 17, N. Y.

Vacuum Filters Feature Easy, Non-Clog Operation

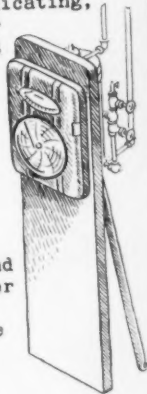
241. Get full data on vacuum filters using double layers of continuous coil springs that insure continuous, non-clog operation. Coils are automatically cleaned at each revolution. Kohnline-Sanderson Engineering Corp., Peapack, N. J.

FLOW CONTROL NOTES FROM SIMPLEX

Feeding Chemicals in Proportion To The Raw Water Flow

Problem: to feed ferric sulphate to raw water entering the filter plant generally in proportion to the quantity of water flowing. The most logical way to do this was to use a volumetric dry chemical feeder, actuated by electrical means from a venturi meter installed in the influent line.

Solution: 36" x 18" cast iron Simplex venturi tube and a Simplex indicating, recording and totalizing meter were installed. The meter was equipped with a contactor device operating in conjunction with the totalizing element of the instrument and also operating the mechanism of the remote feeder by electric transmission.



Result: an accurate record of influent flow was made, and coagulant was fed to raw water in the correct dosage. Here again the adaptability of the Simplex venturi meter to measurement and control has been demonstrated.

"IT'S SIMPLEX—IT'S ACCURATE!"

SIMPLEX

VALVE AND METER COMPANY

SIMPLEX VALVE & METER COMPANY
6750 Upland Street
Philadelphia 42, Pennsylvania

Please send free Bulletin #401 entitled "Simplex Type 'H' Meter"

NAME _____

COMPANY _____

ADDRESS _____

CITY _____

ZONE _____

STATE _____

To order these helpful booklets check the coupon on page 36.

How Sewer Departments Clean Catch Basins Faster

243. Cities using Hydrocranes for catch basin cleaning report better, faster, cleaner jobs. Additional excavation jobs keep these versatile units busy. Send for full data today by using coupon. Bucyrus-Erie Hydrocrane Div., So. Milwaukee, Wis.

Book Tells How to Control Root Stoppages

249. Details on the proven use of copper sulfate to control root and fungous growths in sewers are contained in a brand-new book published by Phelps Dodge Refining Co., 40 Wall St., New York 5, N. Y.

How to Dispose of Sewage and Industrial Sludges

281. Get full information on the C. E. Raymond System of combined incineration and sludge drying providing high temperature de-

odorizing for nuisance-free sludge disposal. Flexible layouts fit large and small communities. Use handy coupon or write Combustion Engineering-Superheater, Inc., Flash Dryer Div., 200 Madison Ave., New York 16, N. Y.

POWER AND LIGHT

Modern Power Plants Need Diesel Economy

67. Baldwin Series 700 diesel engines are described in a new bulletin, No. 320, just issued by the Baldwin-Lima Hamilton Corp., Philadelphia 42, Pa. These engines are four-cycle with a 17-inch bore, 20-inch stroke, 257 to 375 rpm. Horsepower ratings range from 710 hp. to 2,080 hp. Check coupon now for full data.

... if she knew what Centrline means to her



Each time this lady, and millions like her, turns on her water faucet, she benefits from the Centrline process.

In cities where water pipes and mains have been Centrlined, there will be no loss in pressure, or water contamination due to corrosion and tuberculation... no increase in water bills for her due to increased pumping and maintenance costs... no inconvenience due to torn-up streets.

Yes, this lady *should* know about

Centrlining... and so should you. The Centrline process thoroughly cleans pipelines in place up to 144" in diameter—coats the walls centrifugally with strong cement-mortar and trowels it to a smooth even surface... strengthening the pipe... making it better than new. Corrosion is prevented, leakage is stopped, flow capacity improved. Write for your copy of Centrline's new booklet describing this time proven process.

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ON THE WEST COAST, WRITE PIPE LININGS, INC., P. O. BOX 3428,
TERMINAL ANNEX, LOS ANGELES, CALIFORNIA

To order these helpful booklets check the coupon on page 36.

SPECIAL SECTION FLUORIDATION

What You Should Know About Fluoridation and Fluoridators

155. Two helpful publications issued by Wallace & Tiernan titled "Fluoridation" and "Fluoridators" show the development of fluoridation, list the chemicals and dosage normally used, and give full technical data on solution feed and dry feed fluoridators. Be sure to get these publications from Wallace & Tiernan by checking the coupon today.

Chemical Feed Pump For Chlorinating and Fluoridation

167. For complete data on a heavy duty, positive displacement, diaphragm type pump for accurate feeding, chlorinating and fluoridation solutions, get new Bulletin PM 20 issued by Precision Machine Co., 5 Union St., Somerville 43, Mass. Use the coupon today.

Technical Service Offers Help on Fluoridation Planning

207. Helpful information to assist in planning new installations and improvement of existing fluoridation systems is available from General Chemical Div., Allied Chemical & Dye Corp., 40 Rector St., New York 6, N. Y. Check the handy coupon today.

How to Make Fluoride Determinations

244. Information on the Hellige Aqua Tester for precise fluoride control is available in the range from 0 to 1.6 ppm fluoride is available from Hellige, Inc., 3718 Northern Blvd., Long Island City 1, N. Y., by using coupon.

Data On Use Of Hydrofluosilicic Acid

208. The properties, usage and advantages of 30% Hydrofluosilicic Acid for fluoridation of public water supplies is covered in a new pamphlet published by Du Pont. Text includes safety precautions and rates materials for handling this chemical. Check coupon for details, or write E. I. du Pont de Nemours & Co., Inc., Organic Chemicals Dept., Wilmington, Del.

CIVIL DEFENSE

Check Your Power Needs Without Delay

68. International Harvester Company has available a new folder describing its line of diesel engines and power units for all your power needs up to 180 hp. For a copy of this colorful booklet, write to International Harvester Co., 180 N. Michigan Ave., Chicago 1, Ill., and ask for Form A-156-NN, or use the handy coupon and we will forward your request.

Get the Facts on Air Raid Sirens

86. There's more to be considered in air raid warning sirens than the loudness of the signal. Get complete information on efficient size and spacing of sirens from Federal Enterprises, Inc., 8733 So. State St., Chicago, Ill., by using coupon.

Air Cooled Engines for Hundreds of Applications

137. Tested under severest conditions of long, hard use, these engines have earned world wide recognition as the "right" power of hundreds of applications. Get latest bulletin from Dept. PW, Briggs and Stratton Corp., Milwaukee 1, Wis.

Are You Ready Now To Make Main Repairs?

214. Broken water mains can quickly be repaired when you have "Skinner-Seal" Split Coupling Clamps on hand. Get Skinner Catalog #1 now—this handsome 40-page book shows how to make every type of pipe repair and covers a complete line of clamps to do the job quickly and easily. Just check the handy coupon for your copy. M. B. Skinner & Co., Se. Bend 21, Ind.

SOLVES Many JOB Problems

VERSATILE ONE-MAN OPERATION SAVES Time - Manpower - Equipment

The new Holmes-Owen Loader offers a very practical solution to many of the problems which state, county and city officials are now facing in providing increased community services.

The new self-loader provides the answer to such problems, for this equipment converts the usual dump truck into an independent working unit capable of performing a wide variety of work. It saves time, labor and the use of more costly equipment by permitting the truck driver to do his own light digging, grading, loading, and cleaning-up.

A dump truck with such versatile one-man operation can easily do the work of several men, thereby drastically cutting the cost of many jobs, such as: the handling of various stock pile materials, removal of debris, trash, snow, etc., cleaning-up of streets, intersections, parkways, etc. Let us show you how a Holmes-Owen Loader will solve your work problem. Ask your equipment dealer for details or write factory direct.

Manufactured by

Developers of HOLMES WRECKER Equipment

ERNEST HOLMES COMPANY, Chattanooga, Tenn.



DRIVER controls digging and loading operation from cab.



One-man operation speeds up **LOADING, HAULING and UNLOADING.**

RCA 2-Way Radio For More Protection

139. A new brochure on RCA 2-way radio systems for public safety is available for all Public Works and Civil Defense planners. Use the coupon for your copy, or write RCA Engineering Products, Dept. P-154, Camden, N. J.

Protection Against Power Failure

149. Data on stationary, portable, and standby electric plants, AC and DC, are offered by D. W. Onan & Sons, Inc., 7657 University Ave., Minneapolis 5, Minn. Several bulletins cover diesel and gasoline-driven plants for every purpose. Just check the coupon for your copies.

Warning Sirens Give Low Cost Coverage

219. Foster type 45 siren is easily recognizable, non-directional, not affected by cold. Powerful warning signal gives low cost per sq.

mile coverage. Use coupon to get descriptive Bulletin 29. Foster Engineering Co., 835 Lehigh Ave., Union, N. J.


CONSTRUCTION EQUIPMENT AND MATERIALS


Investigate These Versatile Tractor Mounted Machines


20. Be sure to check the Traxcavator for the digging, grading, carrying and loading jobs handled by every public works department and contractor. Rated capacities range from $\frac{1}{4}$ to 4 cubic yards. Full data on the Traxcavator and other machines engineered to match Caterpillar track-type tractors in Form 1106, published by the Trackson Co., Dept. PW-91, Milwaukee 1, Wis. Use coupon to order your copy.





No feature is more important in your chlorinating equipment than safety—and no feeder is safer than BUILDERS Visible Flow CHLORINIZER.

 Chlorinizer is **SAFE** because its system is under vacuum from chlorine control valve to injector inlet, eliminating possibility of chlorine escaping into the operating room.

 Chlorinizer is **SAFE** because inlet valve closes instantaneously with substantial spring-imposed force, if any condition exists which is not proper for safe operation, including failure of water supply or breakage of any part of the vacuum system.

 Chlorinizer is **SAFE** because chlorine gas is automatically exhausted to exterior of building by simple flow-actuated relief valve, if vacuum is reduced below safe operating condition.

 Chlorinizer is **SAFE** because water is prevented from entering vital parts of the mechanism because relief valve admits air to bell jar automatically to limit vacuum under abnormal conditions.

 Chlorinizer is **SAFE** because it's simple . . . easy to understand . . . easy to operate and to keep in top operating condition.



For Bulletins 840-F2A, 840-F1A, and 840-JB, address Builders-Providence, Inc. (Division of Builders Iron Foundry), 336 Harris Ave., Providence 1, R. I.



BUILDERS PROVIDENCE

Instruments



Your Dump Truck As a Complete Working Unit

39. The addition of a Holmes-Owen Loader to four dump truck converts it into a complete digging and loading unit that enables one man to load, haul and dump. Illustrated folder shows how this self-loading unit with hydraulic crowding action can be a real time and labor saver for the municipality or contractor. Check the handy coupon for full data. Ernest Holmes Co., Chattanooga, Tenn.

Compact "Auto-Air" Compressor Eliminates Second Engine

40. A second engine is eliminated by the Davey "Auto-Air" compressor, which is powered by a power takeoff on the truck drive shaft. Compact design permits utilization of remainder of truck body space for transportation of men, tools and materials. Be sure to investigate this efficient compressor that lets one truck do the work of two. Davey Compressor Co., Kent, Ohio.

Handbook of Contractors Pumps Is Easy to Use

49. Big 50-page Catalog P-10 covers de-watering pumps, pressure pumps, well point systems and electric pumps, and also features a special section of useful data which helps in the selection of the right pump for your job. Every construction engineer and contractor should have a copy of this valuable handbook. Just check the coupon. The Jaeger Machine Co., 400 Dublin Ave., Columbus 16, Ohio.

Municipalities Make Equipment Dollars Go Further

55. Be sure to get your copy of "Saving Facts," a new illustrated booklet prepared by The Oliver Corp. that shows how equipment dollars can be stretched on municipal work. Text and photos describe the application of tractors and money-saving attachments in street maintenance, snow removal, waste disposal, pipe laying and other projects. Write The Oliver Corp., Industrial Div., 19300 Euclid Ave.,

Handy Catalog Covers Complete Tractor and Grader Line

70. A new 20-page booklet in a handy pocket size features Allis-Chalmers complete industrial tractor line. The importance of wise buying and fitting the equipment to the job is emphasized. Don't miss your copy. Use coupon today. Allis-Chalmers Corp., Tractor Div., Box 512, Milwaukee, Wis.

Drill Concrete With Your Ordinary Electric Drill

82. Substantial cost-per-hole savings are claimed for Tilden Rotary Drills which penetrate concrete 2" to 4" per minute. Cutters can be resharpened. Available in $\frac{1}{4}$ " to 4". Get full data from Tilden Tool Mfg. Co., 209 Los Molinos, San Clemente, Calif.

Be Sure to Investigate The Gledhill Grader

117. For economical maintenance of streets and highways, be sure to check the advantages offered by use of the Gledhill grader, product of the Gledhill Road Machinery Co., Galion, Ohio. For complete specifications on several models, just check the coupon.

Helpful Booklet on Carryable Centrifugal Pumps

129. A booklet prepared to give practical information that will guide you in choosing the best type of pump for your requirements is offered by the Homelite Corp. Both gasoline and electric models are discussed, and requirements outlined for many applications. Just check the coupon for your copy. The Homelite Corp., 2112 Riverdale Ave., Port Chester, N. Y.

Tractor-Mounted Backhoe Simplifies Digging Operations

238. Be sure to investigate the new Henry Backhoe to cut digging costs on laterals, footings, septic tanks, graves. Easily attached to your tractor. Get full data from Henry Mfg. Co., 1752 N. Clay St., Topeka, Kansas, by using coupon.

Insurance Benefits For Civil Employees

256. Civilian government employees are offered insurance protection at the lowest possible cost by Government Employees Insurance Companies, Gov't Employees Insurance Bldg., Washington 5, D. C. Full details available by checking the coupon.

To order these helpful booklets check the coupon on page 36.

Three-Wheel Roller For General Purpose Duty

142. A new 20-page bulletin describing general purpose 3-wheel rollers covers 8, 10, 12 and 14-ton gasoline and diesel models of the Huber line. Illustrations and comprehensive explanation show component parts of the rollers and describe the general duties of the units. For your copy of this attractive bulletin, No. H-150, write the Huber Mfg. Co., Marion, Ohio, or use the coupon.

Have You Investigated Aluminum Gratings?

200. Aluminum gratings for walkways, bridge decking, and stair treads save weight, resist corrosion and are easily handled. Get complete design data, including safe load tables, standard panel widths and weights, from Irving Suiway Grating Co., 50-53 27th St., Long Island City 1, N. Y. Just check the handy coupon.

Profitable Construction with Payloader

234. A comprehensive, 12-page catalog filled with on-the-job photos showing a wide variety of earth-moving, material-handling, lifting and carrying jobs being performed by the multi-purpose tractor-shovels known as "Payloaders" is now available. Helpful job data, specifications and features of the complete Payloader line are included, with illustrations of useful accessories. Copies of this colorful catalog No. 217 can be obtained from The Frank C. Hough Co., 761 Sunnyside Ave., Libertyville, Ill., or by checking the coupon.

Choosing Trucks For Municipal Service

264. For all municipal services, trucks are today that are high in efficiency and economy. Be sure to investigate the White 3000, engineered for high performance. Full details on White Super Power trucks from the White Motor Company, Cleveland 1, Ohio.

Maintenance Guide Helps "Cat" Users

268. A new, cartoon-style Maintenance Guide shows how to follow good maintenance practices for the smaller size "Cat" diesel engines and electric sets. Fuel systems, lubrication, cooling, intake and exhaust systems are covered in easy-to-read fashion. Check the coupon for a copy. Caterpillar Tractor Co., Peoria 8, Ill.

STREETS AND HIGHWAYS

How the Mobil-Sweeper Can Improve Street Sweeping

23. Sweeping costs can be cut with the new Mobil-Sweeper which features safe highway speeds up to 55 mph, carries 2 2/3 cu. yd. dirt hopper, sweeps swath up to 10' wide with full floating brooms. Hills and deep gutters are no obstacle. Write to The Conveyor Co., 3260 E. Slauson Ave., Los Angeles 58, Calif. or use coupon for complete details on this machine.

Levels Sidewalks and Curbs Quickly and Easily

29. How the Mud-Jack Method for raising concrete curb, gutter, walks and streets solves problems of that kind quickly and economically without the usual cost of time-consuming reconstruction activities—a new bulletin by Koeberling Company, 3026 W. Concordia Ave., Milwaukee 10, Wis.

Get Data Now On This Catch Basin Cleaner

34. Simple powerful pneumatic bucket is featured by Netco Catch Basin Cleaner. Folder 35A gives details and illustrates operation of complete self-powered truck mounted unit. Netco Div., Clark-Wilcox Co., 118 Western Ave., Boston 34, Mass.

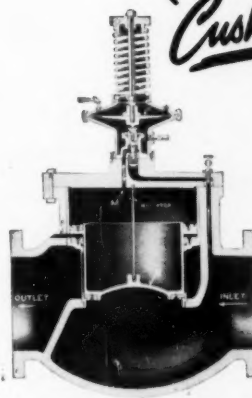
Do You Have Complete Black Top Equipment Data?

41. In 36-page catalog AA a full line of equipment for black top road construction and maintenance is covered. Units described and illustrated include several models of pressure distributors, supply tanks, sprayers, brooms, asphalt kettles, portable rollers, and accessory tools. Use coupon for copy of this handy manual. Littleford Bros., 452 E. Pearl St., Cincinnati 2, Ohio.

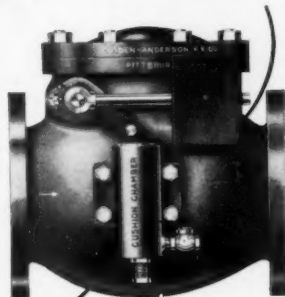
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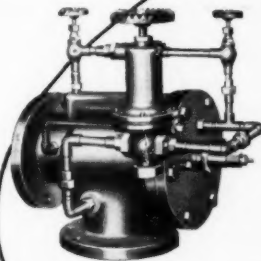
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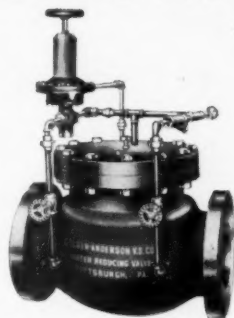
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These Golden-Anderson cushioned automatic valves are specifically designed for use in water works systems. Our experienced engineers will be glad to work with you on your pressure control problems. Write us today—no obligation.

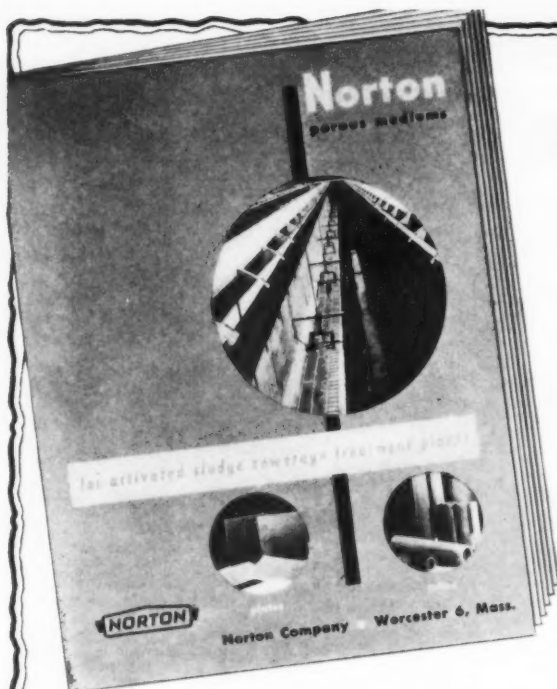
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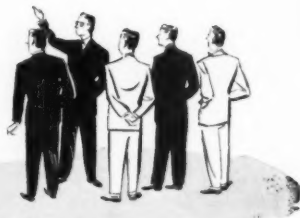
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Latest Facts about porous mediums...

FREE BULLETIN 1246 gives you the most comprehensive coverage of every factor concerned with the selection, installation and cleaning of Norton ALUNDUM® porous plates and tubes for activated sludge plants.



... FOR ACTIVATED SLUDGE SEWAGE TREATMENT

Never before has so much vital information about porous mediums been packed in a 20-page bulletin. Here the 33 years' experience of Norton engineers and researchers has been boiled down into easy-to-read form.

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Seven pages of charts and data cover every variable that enters into the job of choosing the right porous medium for your plant.

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Four pages of drawings, instructions and specifications make it easy for you to superintend correct installation.

How To Clean

All the causes and cures of clogged plates and tubes are handled in fine detail in four fact-packed pages. Pro's and con's of the various cleaning methods are frankly laid on the table.

Write for Bulletin 1246

... and get the most interesting, most informative treatise on porous mediums ever published. NORTON COMPANY, 222 New Bond St., Worcester 6, Mass.

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POROUS MEDIUMS

Aerial Surveys and**Maps from Photographs**

53. Written in non-technical language, a 16-page booklet with this title gives a complete explanation of aerial surveys for the municipal field. Interesting step-by-step pictures show how planimetric and topographic maps, mosaics and atlas sheets are produced by Abrams Aerial Survey Corp., Lansing 1, Mich. Check the coupon for your copy.

How to Beat**The Weed Problem**

66. Be sure to investigate weed control with selective chemical weed killers that get roots and all. Send in coupon today for bulletins on Dolge products that will rid roadsides, parks and lawns of the weed nuisance. C. B. Dolge Co., Dept. PW, Westport, Conn.

Grading Can Be Faster, Cheaper and Easier

96. You'll like every feature of the Austin-Western 99H Grader. It has all-wheel drive, all-wheel steer, controlled traction, precision sideshift and a high lift, extreme reach, reversible blade. Get data from Austin-Western Co., Aurora, Ill.

Reference Manual on Guardrail Design

114. Here is an interesting and informative booklet in which all factors influencing guardrail design are outlined, and safety and economy discussed in detail. Eight pages are devoted to basic design data, with handy tables covering physical properties, tensile and beam strengths, deflection and other data. Write Armco Drainage and Metal Products, Inc., Dept., PW, Middletown, Ohio.

Black-Top Paver Offers Many Advantages

150. The flexible Adnurn Black Top Paver lays any asphalt mix, hot or cold, in widths from 6 ft. to 13 ft. Careful design lowers operating cost and cuts maintenance. Attachments spread stone, cinders or slag. Get full data on this machine by checking coupon. The Foote Co., 1954 State St., Nunda, N. Y.

How to Save Time on Curb and Gutter Work

143. Every type of curb and gutter work is illustrated in the 12-page Helzel catalog on steel forms for building concrete curbs, gutters and sidewalks. Time-saving setups show how to speed up the job and save money. Get your copy from Helzel Steel Form & Iron Co., Dept., PW, Warren, Ohio.

How You Can Improve Your City's Street Cleaning

162. The Austin-Western Model 40 sweeper features three wheel design, front wheel steer, for easy maneuvering; rear broom to sweep dirt and refuse directly into 2-yd. hopper; built-in flushing device. Diagrams showing all operations and full specifications in Bulletin AD-2042, issued by Austin-Western Co., Aurora, Ill.

Case Histories of Sidewalk Resurfacing

170. A very interesting brochure dealing with sidewalk resurfacing and waterproofing shows how easily-applied "Plastic Rock" asphaltic concrete results in an attractive, non-skid wearing surface. Use the coupon for full information. United Laboratories, Inc., 16801 Euclid Ave., Cleveland 12, Ohio.

Fast Marker for Traffic Guide Lines

205. Free-floating, adjustable paint shields on the Mark-Rite Econo-Liner follow surface contours and produce sharp lines in any width from 2" to 6". The machine is said to paint 10,000 to 15,000 feet of line per hour. For details write Universal Mfg. & Sales Co., 8716 Santa Fe Ave., South Gate, Calif., or use the coupon.

Valuable Booklet Tells Soil Stabilization Facts

206. All forms of soil stabilization, using any type of binder with any suitable aggregate, are covered in "Soil Stabilization Methods," Bulletin 25 published by Seaman Motors, Inc., Milwaukee 3, Wis. Get this valuable booklet for complete information on processing methods and the many uses of the Seaman Pulvi-Mixer by checking the coupon.

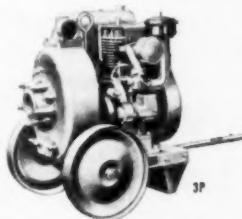
a JAEGER never races to prime



*Dewatering 1500' of 8' x 14' deep sewer trench at a river crossing, this 4" Jaeger pump handled 40,000 gph at an average speed of only 1200 rpm (10% to 15% lower speed than other pumps), and reprimed quickly, as needed, at 1400 rpm (compared with 1300 to 2000 rpm required to prime ordinary pumps).

Pump longer because they pull stronger at easy speeds

Jaeger "Sure Prime" Pumps are built oversize with larger shells and impellers, and generously powered. They hold more priming water and are subject to less abrasive wear. Exclusive double priming action is fast, dependable, without harmful racing of engine. No vapor lock even when pulling high vacuum on long intake lines—sustained efficiency on non-stop pumping, and thousands of extra hours of service from both pumps and engines.



Other sizes 1½" to 10"

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400 Dublin Ave., Columbus 16, Ohio

COMPRESSORS • MIXERS • HOISTS • TOWERS • PAVING MACHINERY

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Your BEST Garbage Collection System is UNDERGROUND!

Every time a Westinghouse WASTE-AWAY®
goes into a home in your Community

THIS HAPPENS:



The city saves on manpower and
collection equipment.

The city improves its service department's
efficiency... service complaints decline.



The city raises its health standards... is a
better, cleaner community in which to live.

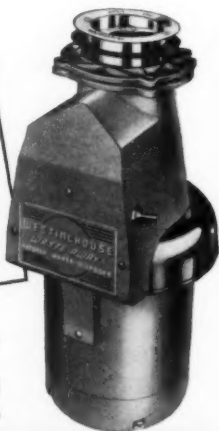
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Beautiful Lawns

Enhance City Property

212. For every step in lawn care and seasonal maintenance be sure to read "Lawn Care", an interesting periodical sent without obligation by O. M. Scott & Sons Co., 80 Spring St., Marysville, Ohio. Just check the coupon.

Helpful Data on Distributors

For Bituminous Materials

240. Two models of pressure distributors featuring uniform pressure and temperature, accurate displacement pumpings, fast loading, are covered in Bulletins RS 31549 and RS 12046, available from Standard Steel Works, Dept. FW, North Kansas City, Mo. Check the coupon to request your copies.

Heating, Thawing and Melting

With Hauck Burner Equipment

277. A helpful 16-page bulletin covers the complete line of Hauck heating and melting equipment. Data covers units for every water, sewer and street department purpose, from "one-man" burners to large size portable kettles. For a useful addition to your reference file, get Bulletin 1068 from Hauck Mfg. Co., 117-127 Tenth St., Brooklyn 15, N. Y.

Fast Mowing in Hard-to-Reach Places

279. The lightweight, power driven Sythette cuts smoothly in rocky, hard-to-reach places; does the job 4 times faster than ordinary methods. Illustrated folder offered by Hoffco, Inc., Richmond, Ind. Get your copy by using coupon.

WATER WORKS

Standard Specifications

for C. I. Pipe and Fittings

278. Standard dimensions for cast iron water pipe and special castings are available in a convenient booklet offered with the compliments of U. S. Pipe and Foundry Co., Burlington, N. J. Get your copy by checking the coupon.

Corrosion Protection

For Water Works

280. Steel pipe lines, elevated tanks, treatment plant equipment and all other steel structures subject to rust, tuberculation and attack by aggressive soils can be protected by long-lasting Bituminous enamels. Send for bulletins today so that you can specify the right coating for your job. Use coupon or write Koppers Co., Tar Products Div., Dept. 255T, Pittsburgh 19, Pa.

How to Keep Trenching

Jobs on Schedule

24. The easy maneuverability of the tough, compact Cleveland Model 93 "Baby Digger" makes it well suited for the difficult job of trenching past the many obstacles of city and suburban work. Multiple digging and crawler speeds handle all soil types and trench widths up to 24". Get Bulletin S-52 from Cleveland Trencher Co., 20100 St. Clair Ave., Cleveland 17, Ohio.

Is Your City

Metered 100%

33. 100% metering as practiced by many cities requires accurate, dependable meters with interchangeable parts. Cut-away views of every part, capacity and size data are all included in handsome American-Niagara water meter booklet available from Buffalo Meter Co., 2920 Main St., Buffalo 14, N. Y.

Do Your Water Mains

Need Cleaning?

38. Literature on Flexible method of cleaning water mains any size from 2" to 72", giving full details and list of nearest representatives in all parts of country. Address: Flexible Underground Pipe Cleaning Co., 9059 Venice Blvd., Los Angeles, Calif.

Seven Advantages of Prestressed Concrete Steel-Cylinder Pipe

43. All the things you want in water supply lines: permanency, structural strength, high carrying capacity, easy tapping, design flexibility.



B.O.D. reduced over 98%
...from 3000 ppm to 33 ppm!

That's the job this industrial waste treatment plant is doing at the L. A. Dreyfus Company in Oaktree, New Jersey. Installed in a residential neighborhood, the plant plays an important part in this Company's comprehensive waste treatment control plan. The flowsheet includes equalization and pre-digestion in special 30' dia. Dorr Digesters followed by the Biofiltration System using a Dorr Clarifier and a Dorrco Distributor.

There's no "cure-all" for industrial waste treatment. But there's a good chance that Dorr's diversified equipment and diversified experience can add up to the *right* kind of solution. The L. A. Dreyfus Company's installation is just one example.

- *If you have a waste treatment problem we would welcome the opportunity to work with your consulting engineers. If you are a consulting engineer actively engaged in waste treatment, our experience is at your disposal.*



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MOBIL-SWEEPER



GETS STREETS CLEANER... AT LOWER COST

You can balance your street cleaning budget through the greater efficiency of a Mobil-Sweeper. Ten years of development bring you unsurpassed sweeping action. The longer draught arms on the rear pickup broom are "full-floating" in the true sense. Deepest dips get a clean sweep where ordinary sweepers would skip over refuse. You get a more thorough job on gutters because Mobil-Sweeper employs the "Decreased Arc" type gutter broom segment that retains its flipping action and gives hundreds of extra miles of clean sweeping. The 200-gallon water tank saves on stops for refills. *Don't be fooled on dirt hopper capacity...* be sure that your sweeper fills to its rated capacity



every time under normal operating conditions. Mobil-Sweeper fills its 2 $\frac{3}{4}$ cu. yd. hopper to the overflow every time—that's what counts. The powerful International Harvester engine lends itself to your standard type maintenance. Your operator is safer in Mobil-Sweeper with its shatterproof windshield, steel cab and 4-wheel hydraulic brakes. Write for details on how your community can save on street sweeping costs.

1

For decontamination of stricken areas, Mobil-Sweeper can scour miles of pavement, spraying 200 gallons of decontamination solutions per trip.

2

Keeping roads open and in usable condition is essential. Roads must be swept clean of debris injurious to tires.

3

Mobil-Sweeper's 55 m.p.h. speed permits it to make fast emergency trips or travel in military convoys to stricken areas. No other sweeper is as adaptable for emergency use nor as safe.

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3260 East Slauson Avenue, Los Angeles 58, Calif. PW-15
Gentlemen:

Please send catalog with complete details and specifications for the Mobil-Sweeper.

Name _____ Title _____
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PUBLIC WORKS for April, 1952

ity, easy installation and economy are claimed for Prestressed Concrete Steel-Cylinder Pipe made by Price Brothers Co., 1932 East Monument Ave., Dayton 1, Ohio. Get full details by checking the coupon.

Engineering Data on Diatomite Filters

44. Detailed information and typical plans of Sparkler diatomite filters for swimming pools of municipal water systems is available to engineers and municipal officials. These filters feature self-cleaning filter elements which cuts wash water to a minimum. Get this material now by using coupon. Sparkler Manufacturing Co., Mundelein, Ill.

Efficient Underdrains for Rapid Sand Filters

59. Be sure you have engineering data on glazed fire clay tile filter bottoms, designed for efficient filtering and backwashing. Check the coupon or write F. B. Leopold Co., Inc., Dept. PW, 2413 W. Carson St., Pittsburgh 4, Pa.

Efficient Coagulation With Ferri-Floc

69. Advantages claimed for Ferri-Floc as a coagulant include wide pH range, quick floc formation, manganese removal, control of certain tastes and odors, plus other aids in high quality water production. Check coupon for complete Ferri-Floc data. Tennessee Corp., Grant Bldg., Atlanta, Ga.

All Electric Floatless Liquid Level Control

78. Description of operating principles and applications of B/W controls shows the simplicity and many uses of these all-electric, floatless devices. Diagrams of typical installations and engineering data all in bulletin 147 issued by B/W Controller Corp., Dept. PW, 2224 E. Maple Rd., Birmingham, Mich.

Factors to Consider in Elevated Tank Selection

80. An interesting discussion of the factors to be considered for selection of elevated capacities and sizes, required fire flows and other useful data are included in a bulletin on elevated water storage published by Pittsburgh-Des Moines Steel Co., Neville Island P. O., Pittsburgh 25, Pa.

Engineering Facts About Transite Pipe

83. This compilation of Johns-Manville's "Engineering Facts" series presents concise, factual information about Transite's many economic and engineering advantages, and includes informative case histories plus dimensions and data for your files. Write Johns-Manville, Box 290, New York 16, N. Y., or use the handy coupon.

Smaller Diameter Water Lines Cement Lining for

89. Water lines from 4" to 12" diameter are now cement-lined in place by Centriline Corp., using the Tate process. Catalog C-50 tells how this operation gives new pipe performance to old lines, and shows just how the work is done. An interesting folder, well worth studying. Check coupon for your copy. Centriline Corp., 140 Cedar St., New York 6, N. Y.

Useful Data on Butterfly Valves

100. Complete descriptions and tables of dimensions on the full line of Rockwell Butterfly Valves is contained in several bulletins published by the company. Construction details and special control features are illustrated. Write W. S. Rockwell Co., 200 Eliot Street, Fairfield, Conn.

Tested Jointing Materials

102. "Hydrotite" is a self-caulking, self-sealing joint compound for bell and spigot pipes. For data book and sample write Hydrotic Development Corp., 50 Church St., New York, N. Y.

The Modern Way to Filter Swimming Pool Water

104. That's the title of a bulletin full of facts about Bowser's new diatomite filter to produce clear, sparkling, clean water at low cost. Occupies small space, doesn't waste water. Gives sizes to use, performance charts, etc. Write Bowser, Inc., Dept. PW, Ft. Wayne, Ind.

To order these helpful booklets check the coupon on page 36.

INTRODUCING..

THE NEW WALLACE & TIERNAN FLUORIDATOR

Series A-635

Design Features

- Either Volumetric or Loss-of-Weight Control
- Loss-of-Weight Recording (optional)
- Dust-tight Construction
- Special Two-directional Feed Screw
- Large Hopper
- Reduces Drossing
- Wide Feed Range



Special requirements of Fluoridation — primarily, extreme accuracy and dependability — were considered foremost in the design of W&T's new Series A-635 Fluoridator. A selection of models and a wide feed range make this feeder suitable for the application of sodium fluoride or sodium silicofluoride in most communities.

The basic feeder is volumetric with manual control, featuring the new two-directional feed screw for increased accuracy. Built-in scales can be supplied for periodic checking of the weight of chemical in the hopper.

The gravimetric, loss-of-weight, model is controlled from a unique scale beam housed in a dust-tight compartment. Registers indicate the rate of feed and the weight of chemical in the hopper at all times. Loss-of-weight recording is available with the gravimetric feeder to provide a permanent record of fluoridation.

**WALLACE & TIERNAN
COMPANY, INC.**

ENGINEERING AND CHEMICAL CONTROL EQUIPMENT
NEWARK 1, NEW JERSEY • REPRESENTED IN PRINCIPAL CITIES

WATER WORKS (Cont.)

Engineering Data on The Permit Precipitator

91. The Precipitator removes impurities from water by precipitation, adsorption, settling and upward filtration; requires less space, less chemicals, less time than any previous design of reaction and settling tank. Data on operating principles, recommended sizes, design details and specifications are included in 20-page illustrated bulletin No. 220A. The Permit Company, Dept. PW9, 330 West 42nd St., New York 18, N. Y. Use the coupon for your copy.

Specs for Gate Valves

112. Rigidly inspected gate valves for pressures up to 175 lbs. by R. D. Wood Co. Sizes 2" to 30"; for any standard type joint. R. D. Wood Co., Public Ledger Bldg., Philadelphia 5, Pa.

How to Tap Concrete Pressure Pipe

126. The simple steps required in making a pressure tap in concrete pressure pipe are explained in a booklet issued by Lock Joint Pipe Company. Be sure you know how either large connections or small service outlets may be made economically and without sacrifice of strength. Just check the handy coupon. Lock Joint Pipe Co., Box 269, East Orange, N. J.

How Elevated Water Tanks Can Save on Operating Costs

134. Beautiful new booklet on Horton elevated steel water tanks suggests ways to reduce pumping costs, increase capacity of systems, maintain uniform pressure, etc. Illustrates 7 models of welded, ellipsoidal-bottom, elevated steel tanks in full color. Write Chicago Bridge & Iron Co., 2115 McCormick Bldg., Chicago 4, Ill.

How Your Filter Washing Can Be Improved

136. More thorough sand washing with the elimination of mud balls and cracking with resultant longer filter runs are claimed for the Palmer Filter Bed Agitator, described in bulletin issued by the Palmer Filter Equipment Co., P. O. Box 1655, Erie, Pa.

Easily Cleaned, Long Run Filter Bed Media

140. Bulletins on Anthracite tell the reasons why selected, graded crushed anthracite is superior to stand as a filtering material. Have you made a full investigation. Write Anthracite Equipment Corp., Wilkes-Barre, Pa.

Faster Pipe Laying With Precaulked and Threaded Joints

148. McWane 2" cast iron water pipe with threaded joints and pre-caulked bell and spigot pipe are described in folder WM-47. Additional data on 3" to 12" centrifugally cast pipe and fittings in folder WL-47, both issued by McWane Cast Iron Pipe Co., Birmingham 2, Ala.

Rehabilitation for Your Water System

153. Whether your water supply system requires a complete rehabilitation program including an engineering survey, hydraulic analysis, reconditioning and related construction, or merely pipe cleaning and coating, it is wise to plan your campaign without delay. Get full data now on the requirements to put your system in top condition. Write Pittsburgh Pipe Cleaner Co., 133 Dahlem St., Pittsburgh 6, Pa., or check handy coupon.

Helpful Data on Corporation Stops

161. A complete line of brass goods for water works: corporation stops, curb stops and service pipe couplings, gossenecks and other fittings are illustrated and described in catalog W-39, issued by A. Y. McDonald Mfg. Co., Dubuque, Iowa. Get your copy for ready reference.

What You Should Know About Meter Setting and Testing Equipment

166. Complete details on all equipment and proper methods for meter testing and installation are included in an excellent book published by Ford Meter Box Co., Wabash, Ind. All waterworks men concerned with setting and testing of water meters should have a copy of this book. Write for Catalog No. 50.

Pipe Joint Essentials and Couplings for Every Job

168. Superior pipe joints are tight, flexible, simple, strong and economical. Dresser's handsome 34-page bulletin No. 513 shows how these essentials are met and provides layouts for curves, working pressures and a wealth of other data. Be sure to check this bulletin on the coupon. Dresser Mfg. Div., 59 Fisher Ave., Bradford, Pa.

Be Sure To Investigate The Be-Ge Trencher

171. Municipalities and contractors both report that the Be-Ge trencher, with its fully hydraulic operation and easy maneuverability, cuts costs and brings profits on all types of trenching jobs "Hydratrans" fluid motor delivers smooth, positive power at any creep speed. Digs up to 24" wide and 5 ft. deep. Hydraulically controlled backfiller blade is standard equipment. Get form 520 from Be-Ge Mfg. Co., Gilroy, Calif., by checking the handy coupon.

Helpful Data on Well Water Systems

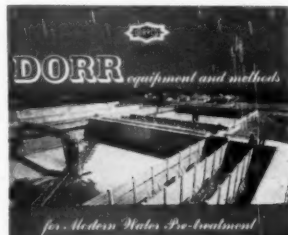
173. A comprehensive, 48-page book on Layne Water Well Systems covers gravel well, underreaming, cemented walls, rock wells and other well types. Applications of shutter screens and vertical turbine pumps are shown, together with water treatment and conditioning equipment. Ten pages are devoted to useful engineering tables and measurement data. Check the coupon today or write Layne & Bowler, Inc., Dept. PW, Memphis 8, Tenn.

Engineering Data On Mechanical Joint C.I. Pipe

183. General specification, weights and dimensions of mechanical joint cast iron pipe and fittings are furnished in a 32-page booklet issued by Alabama Pipe Co., Anniston, Ala. Get this helpful data by checking coupon.

Turbidity Color and Hardness Removal

56. Modern water pre-treatment with Dorr equipment and methods is described in Bulletin No. 9141, which gives basic design data and flow sheets for pre-treating highly turbid water, color removal or treatment of low turbidity.



and softening. Typical analyses for various types of waters are given together with detention times in recommended treatment units. Write The Dorr Co., Dept. PW, Barry Pl., Stamford, Conn.

Complete Catalog for Engineers Shows Water and Sewage Plant Equipment

191. The complete line of Jeffrey equipment for treatment of water, sewage and industrial wastes is covered in 52-page Catalog 833. Detailed information is provided on bar screens, grinders, grit collectors, "jigrit" washers, sludge collectors, feeders, conveyors and other related units. Photos and drawings of installations plus capacity tables complete this valuable booklet. Use coupon or write Jeffrey Mfg. Co., 947 N. 4th St., Columbus 16, Ohio.

Complete Catalog and Reference Data on Valves and Fittings

211. The entire M & H line of valves, fittings and accessories for water works, filtration, sewage disposal and fire protection are illustrated and fully detailed in Catalog 52 issued by M & H Valve & Fittings Co., Anniston, Ala. In addition to complete data on these products, there are many pages devoted to helpful engineering data. Every designer should have a copy. Get yours by checking the coupon.

PUBLIC WORKS for April, 1952

Emergency Chlorination and Main Sterilization

213. Get data on portable emergency chlorination units designed to save time in cases of broken mains or substitute water supplies. Use coupon to order copies of publications 22-C; 58-C; and 408 from Wallace & Tiernan Co., Newark 1, N. J.

Does Your Water Works Have Standby Power?

224. Dependable Climax power plants are ready for emergency service to insure fire protection, and can also save power costs by peak load operation. Use the coupon for full data on Climax, 40 to 495 HP, operating on sewage or natural gas, butane or gasoline. Climax Engine & Pump Mfg. Co., 208 So. La Salle St., Chicago 3, Ill.

Investigate This Compact Flow Meter for Water

226. The Foster "Flow Tube" is a new metering element that is compact and easy to install. Bulletin FT illustrates simple element containing nozzles for differential pressure production and shows capacity range and accuracy. Made in standard type sizes. Foster Engineering Co., Union, N. J. will send copy, or use coupon.

Helpful Data on Main Sterilization

231. This detailed discussion of main and emergency sterilization indicates standard procedure, shows how to calculate quantities of sterilizing solution, describes equipment and gives typical specifications. All calculations can be solved by use of a simple chart. Use coupon to get your copy of Bulletin SM-9365. Proportioners, Inc., 356 Harris Ave., Providence 1, R. I.

Compact Power Unit Leaves More Room for Equipment

248. When you are cramped for space compact diesel power units can help. Investigate diesel power for pumping plants and wherever dependable engines are needed. Use coupon or write Dept. PW, Detroit Diesel Engine Div., General Motors Corp., Detroit 28, Mich.

All About Centrifugal Pumps

258. Where pumping performance counts you want to check your specifications carefully. Investigate the features of Fairbanks-Morse centrifugals. Use coupon or write to Fairbanks, Morse & Co., Dept. PW, Chicago 5, Ill.

General Catalog on Measuring and Controlling Equipment

272. The full line of Simplex equipment for the measurement and control of liquids and gases in water and sewage plant installations is illustrated and described in detail in 28-page Catalog 002. Every engineer should study the design data in this helpful booklet. Write Simplex Valve & Meter Co., 68th & Uplands Sts., Philadelphia 42, Pa., or use the coupon.

Gauges for Good Filter Plant Operation

275. Mechanically operated filter gauges for indicating and recording loss of head, rate of flow, sand expansion and other data needed for good filter plant operation, are described in Bulletin No. 450-H10, issued by Builders-Providence, 356 Harris Ave., Providence 1, R. I. Besides details on the gauges themselves, typical installations are shown. Check coupon for your copy.

REFUSE COLLECTION AND DISPOSAL

A Working Plan for Community-Wide Garbage Grinding

30. In a descriptive booklet "Community-Wide Garbage-Free Living" a sound working plan is outlined for the installation of garbage grinders to eliminate the headaches of garbage collection and disposal, yet at the same time relieving the public officials of difficult financing problems. Get your copy from Given Mfg. Co., Dept. PW, 1250 Wilshire Blvd., Los Angeles 17, Calif. Use the coupon today.

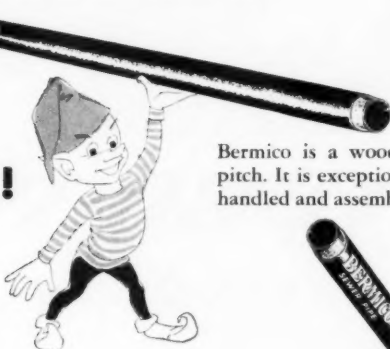
(Continued on page 53)

To order these helpful booklets check the coupon on page 36.

BERMICO®

SEWER PIPE

LIGHT!



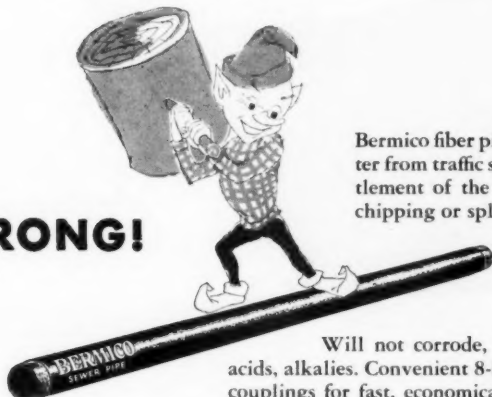
Bermico is a wood fiber pipe, impregnated with pitch. It is exceptionally light in weight, and easily handled and assembled.

Bermico fiber pipe has tapered sleeve joints which are root-proof, water-tight, will not pull apart or get out of alignment. A few hammer taps seal joints permanently, and no joining compound is needed.

TIGHT!



STRONG!



Bermico fiber pipe is sufficiently flexible so it will not shatter from traffic shock nor rupture as a result of uneven settlement of the subbase. Absorbs jars and jolts without chipping or splitting.

Will not corrode, scale or tuberculate. Unaffected by sewage, acids, alkalis. Convenient 8-foot lengths and a complete line of bends and couplings for fast, economical assembly. Write Dept. EB-4 at our Boston office for information.

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CORPORATION, La Tuque, Quebec

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just a reminder that -



A pipeline
is no better
than its
joints . . .

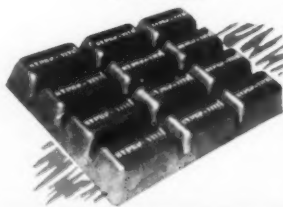
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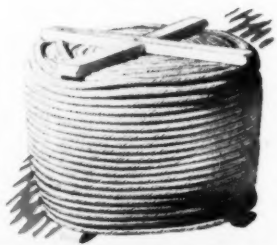
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Powder or
pigs — with
FIBREX • make
perfect joints.
Working sample
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How Load-Packers Reduce Refuse Collection Costs

123. The sequence of operation for fast loading and refuse compression in the Gar Wood "Load-Packer" is illustrated and described in Spage folder M 60, which also provides size data and details of hydraulic equipment. Be sure to check all features of the efficient Load-Packer system. Check coupon or write Gar Wood Industries, Wayne Div., Wayne, Mich.

Investigate This Plan For Garbage Elimination

164. A new presentation, written especially for municipal officials, offers a modern solution for the garbage disposal problem. Be sure you have this up-to-date information on the elimination of city garbage collection by the use of Hotpoint Disposall units. Check the coupon now. Hotpoint Disposall Department, 5600 West Taylor St., Chicago 44, Ill.

Increasing the Efficiency of Bulk Rubbish Collection

177. Strategically spotted bulk containers can be handled by one man operating a Dempster-Dumpster equipped truck. Get full details of this cost-saving system of rubbish collection, as used by many cities to increase efficiency and eliminate unsanitary conditions. Write Dempster Brothers, Inc., 932 Dempster Bldg., Knoxville 17, Tenn., or use the handy coupon.

Save Garbage Collection In Defense Housing

181. Defense housing projects won't drain manpower for garbage collection when Westinghouse Waste-Away Food Waste Disposers are installed in each kitchen. Helpful information for community planners is offered by Westinghouse Electric Corp., Electric Appliance Div., Mansfield, Ohio. Just check the coupon.

An Incinerator Necessity

215. Recuperators featuring individual replacement of the heat transfer elements (silicon carbide tubes) for maximum accessibility and efficiency are described and illustrated in Bulletin 14 issued by Fitch Recuperator Co., Dept. PW, Plainfield Nat'l Bank Bldg., Plainfield, N. J.



**LIFETIME ALUMINUM
LAKE SHORE
MARKERS
654 W. 19th ST. ERIE, PA.**

SIGNS

Cost Less
and
**GIVE YOU MORE
DAY OR NIGHT!**

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DIV. OF LAKE SHORE PATTERN WKS.
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FOR REPAIRING BELL AND SPIGOT JOINT LEAKS...



SKINNER-SEAL
Bell Joint Clamp for stopping bell and spigot joint leaks under pressure. Gasket is completely sealed: at bell face by Monel Metal Seal band—at spigot by hard vulcanized gasket lip.

AND BROKEN MAINS

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Split Coupling Clamp. One man can install in 5 to 15 minutes. Gasket sealed by Monel band. Tested to 800 lbs. line pressure. A lasting repair. 2" to 16" incl.



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SPEED UP...TRENCHING JOBS...SLASH COSTS

BE-GE Hydraspeed TRENCHER

East Bay Municipal Utility District's two Be-Ge Hydraspeed Trenchers speed up trenching for service connection laterals and 16 inch water mains.



In hard soils as well as soft soils, the Be-Ge Hydraspeed Trencher digs cleaner trenches . . . faster . . . at lower cost. By means of fingertip hydraulic controls the operator instantly regulates the digging depth from 0 to 5 feet, and the digging speed from 0 to 12 feet per minute. Mobile and maneuverable in tight places, the Be-Ge is the ideal machine for both new installations and maintenance and repairs on old lines and mains.

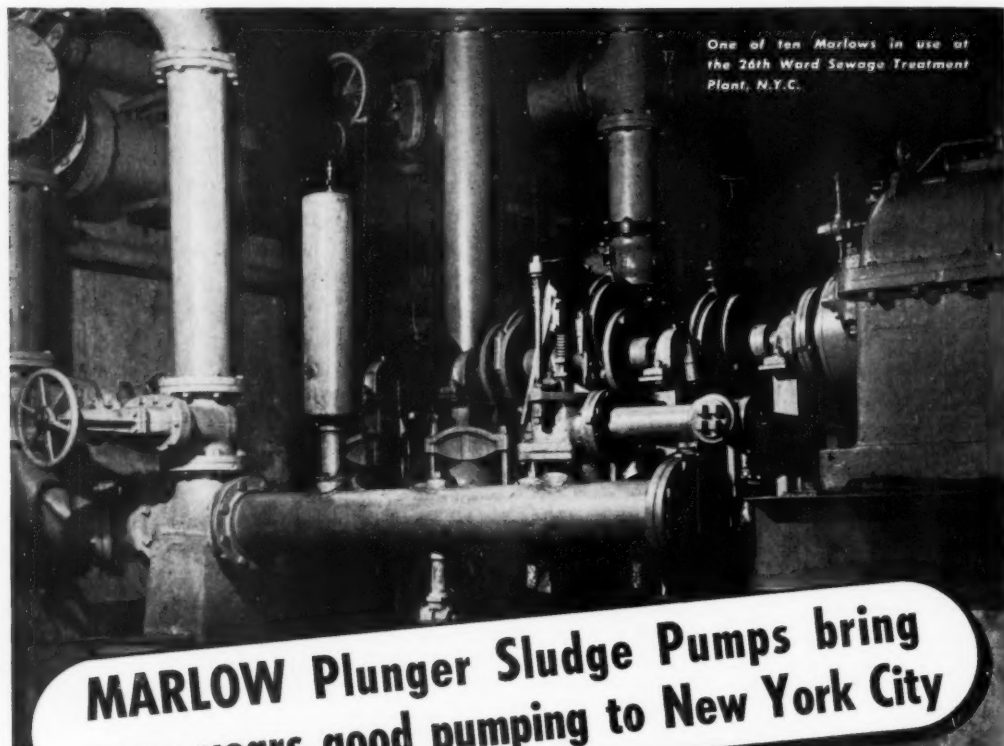
For complete details and specifications see your

J. I. CASE Industrial DEALER

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BE-GE MANUFACTURING CO.
GILROY, CALIFORNIA

To order these helpful booklets check the coupon on page 36.



One of ten Marlows in use at the 26th Ward Sewage Treatment Plant, N.Y.C.

MARLOW Plunger Sludge Pumps bring seven years good pumping to New York City

... and MORE

Most of the ten Marlows installed in this big plant have been on the job since 1943. Four are used for primary sludge, one pumps grease from the primary system to digester, three handle excess secondary sludge and two pump digested sludge from digesters.

Other Marlow New York installations include the Bowery Bay, Jamaica and Coney Island Sewage Treatment Plants.

Marlows are installed in over 400 municipalities across the nation.

And still the list grows.

At present, big Marlow installations are being

made by the city of Baltimore, at Nut Island Sewage Disposal Plant in Boston and at the North Point Sewage Disposal Plant in San Francisco.

Marlows are preferred because they are more efficient, reliable and durable. Marlow Plunger Sludge Pumps are the result of years of advanced pump engineering. They are available with single, double, triple and quadruple plungers. 360 to 30,000 GPH standard displacement.

Write for details. Inquire also about the famous Marlow Self-Priming Centrifugal pumps — portable and stationary models — and Marlow Portable Diaphragm pumps.

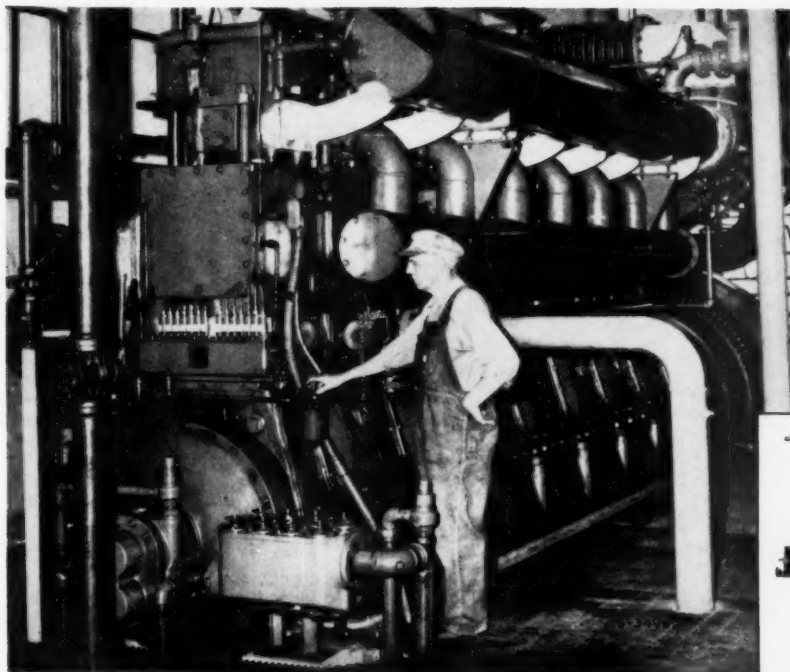


MARLOW PUMPS

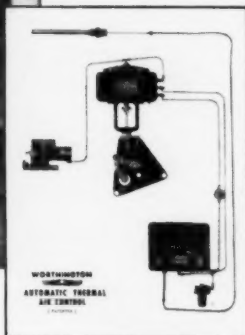
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RIDGEWOOD, NEW JERSEY

Manufacturers of the World's Finest Sludge Pumps

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WORTHINGTON 1,000-KW CAPACITY SUPERCHARGED DUAL FUEL DIESEL used in conjunction with municipal steam generating plant at David City, Nebraska.



Cost-per-kw down over 60% with Worthington Dual Fuel Engine

David City, Nebraska—this city has proof that the Worthington Dual Fuel Diesel can reduce power-plant operating costs.

Engineering of this installation—made in August, 1949—was under the direction of Black and Veatch, Kansas City, Mo., Consulting Engineers. At the present time the unit operates at only one-third capacity in supplementing steam power generation.

In spite of these poor load conditions, the David City plant's overall operating cost per kw was down 60% the first year this engine was used.

ONE BIG REASON YOU GET MORE EFFICIENCY FROM THIS ENGINE

Worthington's Automatic Thermal Air Control—an exclusive patented Worthington feature—is one of the biggest reasons you get more efficiency from this dual fuel engine—or from Worthington gas engines.

Unlike any air throttling mechanism dependent on governor action, this unit is actuated by engine exhaust temperature.

It maintains optimum air-fuel ratio at all times; provides automatic variation of air quantity in direct rela-

tion to ambient air temperatures; automatically compensates for changes in the heating values of the gas fuel (this would require manual adjustment where air-throttle controlled governor is used); maintains highest fuel economy at all loads regardless of changes in air temperature or fuel quality.

Worthington engines can increase your plant's efficiency and lower operating costs. For more facts on Dual Fuel or other engines, gas or Diesel, write Worthington Pump and Machinery Corporation, Engine Division, Buffalo, N. Y.

Worthington-Built Auxiliaries



ENGINE STARTING COMPRESSORS



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EVAPORATIVE-TYPE ENGINE WATER COOLERS

Economical Continuous Power—Diesel Engines, 150 to 2,640 hp . . . Gas Engines, 190 to 2,880 hp . . . Dual Fuel Engines, 150 to 2,640 hp.

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 Please send me the following to be distributed to my associates:

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**Now You Can Save
 up to 30% from
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 AUTO INSURANCE**

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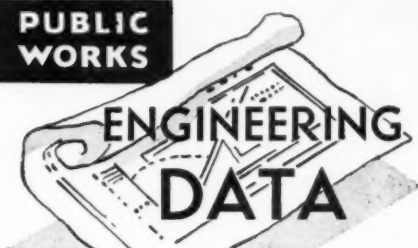
have now made it possible for you and your associates
 — as Preferred Risks — to obtain the finest automobile
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PUBLIC WORKS



Fake Cattle-Guards Fool Cows

A CATTLE-GUARD is a device to keep cattle from wandering from one pasture to another when a road is built through the pasture. Many different types of cattle-guards have been built, and the one most commonly constructed by the Highway Department is built of railroad rails set just far enough apart that cattle hoofs cannot get on two rails at one time, but close enough together so that it will not be unpleasant crossing them in a motor vehicle.



● How New Mexico fools the cows.

Some cattle get smart and walk across the guards at the extreme ends or where the rails are fastened together by cross beams, but most of them after one try give it up as a bad job and stay on their own side of the fence.

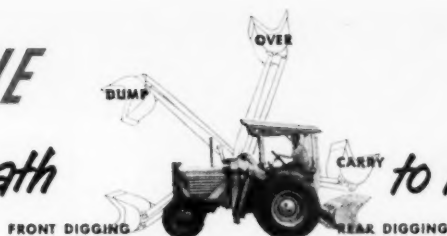
With the shortage of steel and the high cost of installing cattle guards, some bright engineer came up with a solution that reportedly works very well. The pasture fences and posts are installed in the usual manner, but instead of trenching the highway and putting in railroad rails, white stripes to simulate a cattle-guard are painted on the surface of the highway. Cattle that have had experience with the conventional cattle guards will not cross the painted ones, the engineers say.

The accompanying picture shows the painted stripes on State Road 10 near San Antonio. The data and the photo are by courtesy of Lindsay F. Root, Editor of the New Mexico Highway Journal, official organ of the State Highway Department.

● ● ● Cost of Water Main Construction in St. Paul

The annual report for the Board of Water Commissioners of St. Paul, Minn., Leonard M. Thompson, General Manager, shows for 1949 and 1950 the cost of water main construction in that city.

a **STRAIT-LINE** is Your Shortest path



to Profits!

Digs in Rear . . . or Digs in Front

AND, IT MULTIPLIES TRACTION . . . SAVES TURNING
MAKES STEERING EASIER . . . INCREASES STABILITY



Push-Tilt assures fuller buckets even in fine plaster sand.



It takes plenty of traction to move from bank to truck in rough going like this. Rear-carried bucket makes it possible. And, in hard banks, the extra traction and Push-Tilt give you the same fast, profitable loading.

But here is its
Biggest Advantage

... ADDED TRACTION FROM REAR-CARRIED BUCKET

An Oliver Industrial Wheel Tractor and Strait-Line Loader is the biggest profit asset for any loading operation. It digs in back . . . or digs in front . . . *and loads in front*. No time-wasting turning or backing required.

Here's proof. These photos were taken loading out plaster sand, so fine it squirted out through a ten-penny nail hole in the truck body in a stream 4 inches long. Despite this difficult going, the tractor and Strait-Line wheeled its bucket loads *upgrade* without spinning. It

ran back from truck to bank with force. This extra traction for difficult conditions is created by the rear carried bucket.

This is a condition where rear digging solved the problem. In fact, under most conditions, the operator can do *more* with rear digging.

Why not check the Oliver Industrial Wheel Tractor Strait-Line for your loading.

THE OLIVER CORPORATION

Industrial Division: 19300 Euclid Avenue, Cleveland 17, Ohio

A complete line of industrial wheel and crawler tractors.

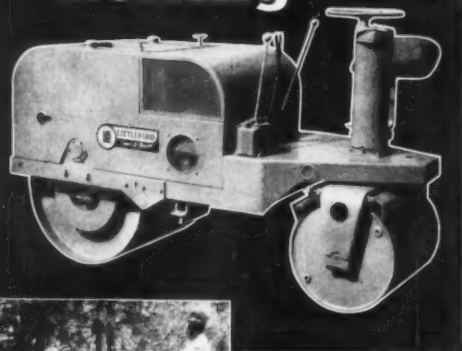


THE OLIVER CORPORATION
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During 1949, thirty-two sections of 6-inch pipe were laid, using trenching equipment. These totalled 25,059 ft., and included 101 specials, 23 gate valves and 40 hydrants. On the average, for all jobs, labor cost \$1.20 per ft. and materials cost \$2.17, a total of \$3.37 per foot. The average cost on six lines less than 500 ft. long was \$4.03 per ft., of which \$1.67 was for labor and \$2.36 for materials.

In 1950, the cost of laying 23,875 ft. of 6-inch pipe, including 112 specials, 34 gates and 35 hydrants, was \$3.56 per ft., of which \$1.21 was for labor.

The cost of 8-inch lines laid during 1949 was \$4.05 per ft., based on 2,068 ft. laid. This included 4 specials, 2 gate valves and 4 hydrants. Labor cost was \$1.69 per ft.. The 1950 cost on 2,567 ft. of 8-inch main, using 13 specials, 4 gates and 2 hydrants, was \$4.15 per ft., of which \$1.40 was for labor.

The cost per foot of 12-inch pipe in 1949 was \$8.21 (\$3.03 for labor, \$5.18 for materials) based on 1,457 ft. and including 6 specials, 3 gates and 3 hydrants. Cost for 1950 was \$6.79 per ft. (\$2.02 for labor, \$4.77 for materials), based on 1,161 ft. with 17 specials and 3 gates.

The 1950 costs for 16-inch, based on 3,930 ft., with 12 specials and 5 gates, was \$9.17 per ft., of which \$2.50 was for labor. On 4,902 ft. of 20-inch and 24-inch, the cost was \$14.18 per ft., of which \$4.77 was for labor. The line included 29 specials and 5 gates.

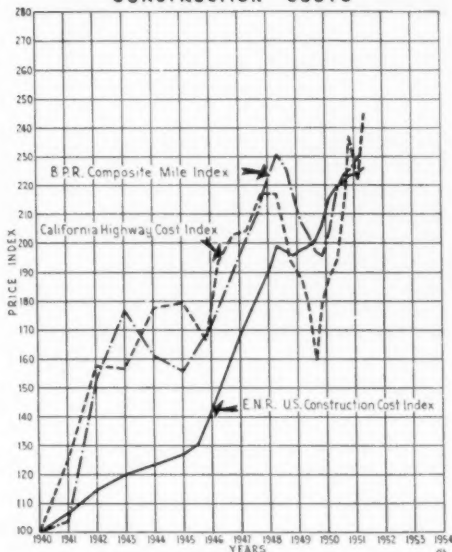
A small amount of 6-inch and 8-inch laid in 1949, on which hand trenching was used, is not included in the above costs.

• • •

Construction Cost Reaches Record High

According to the California State Highway Department, construction costs rose during the fourth quarter of 1951 to reach an all-time high of 245.4. The curve herewith shows how the costs have risen.

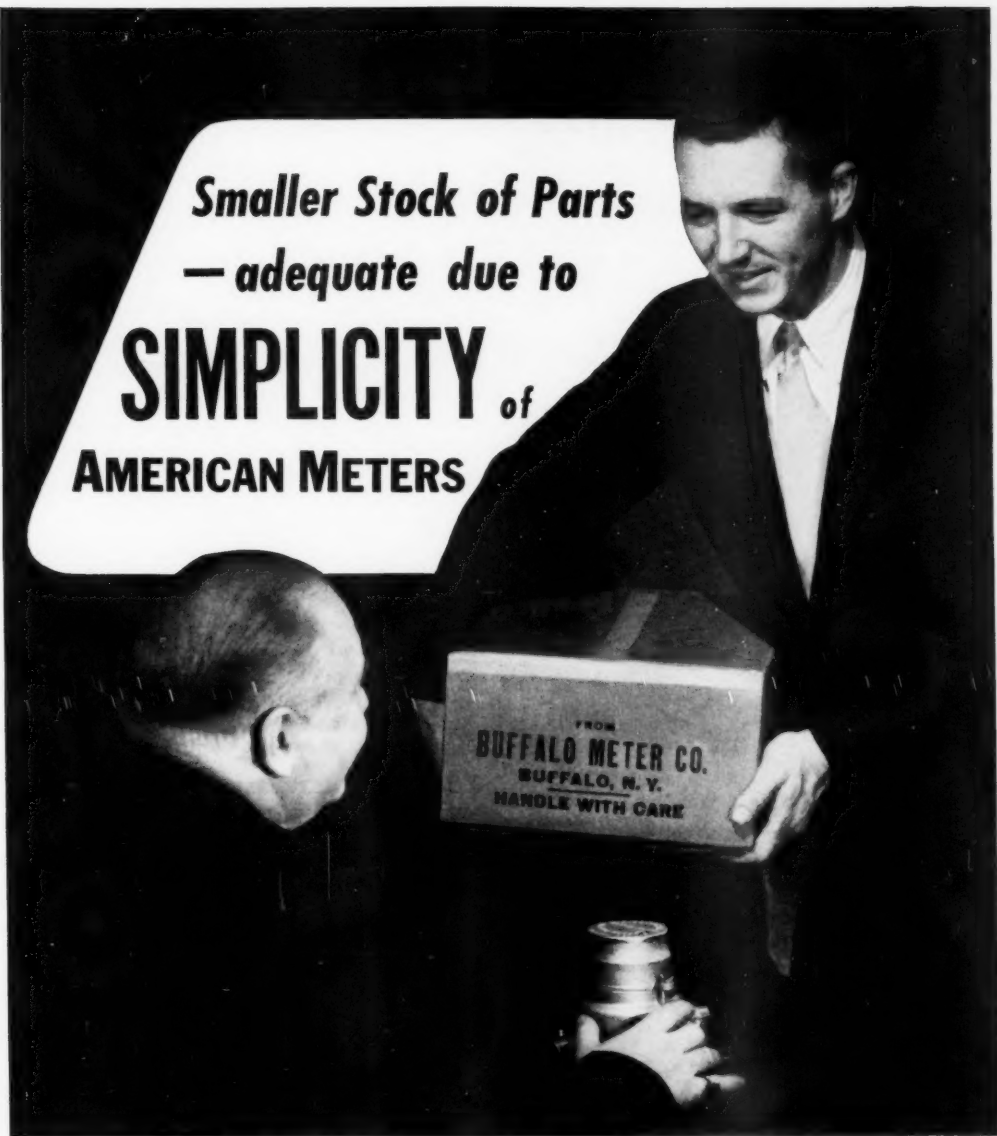
PRICE INDEX
CONSTRUCTION COSTS



● California Highway Department Construction cost index curve to the middle of 1951.

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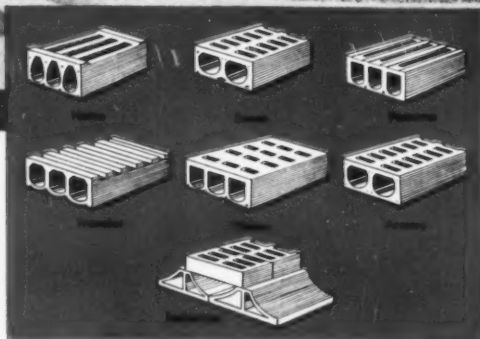
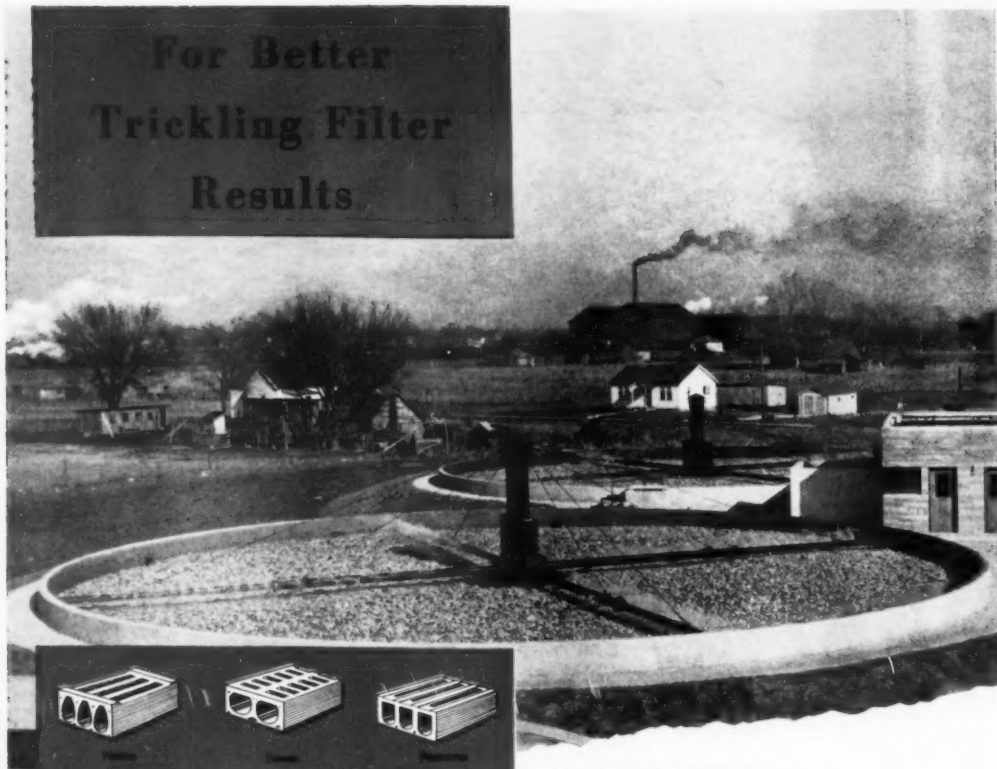
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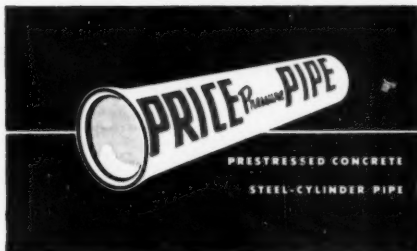
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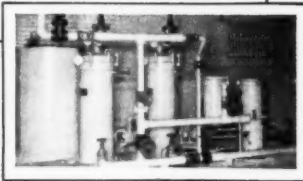
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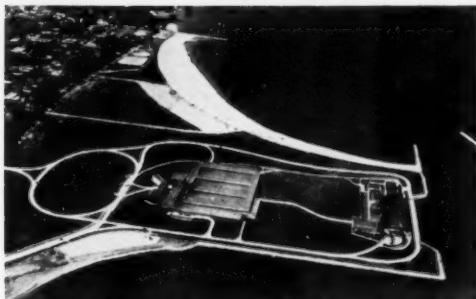
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LINK-BELT experience

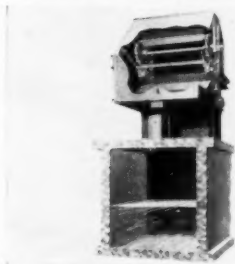


Link-Belt Straightline Collectors provide high efficiency and greater solids concentration at Chicago's first water filtration treatment plant. Peak load capacity is 650 mgd. Designed by City of Chicago Filtration Engineers in consultation with Greeley & Hansen and Alvord, Burdick & Howson.



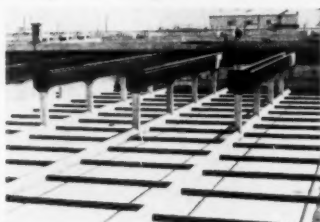
To meet the demands of its rapidly expanding population, Southern California's Metropolitan Water District recently added 100 mgd capacity to their plant at La Verne, making it the world's largest water softening plant. Link-Belt Straightline Mixers and Collectors were selected for the mixing and sedimentation tanks.

Plus LINK-BELT quality components



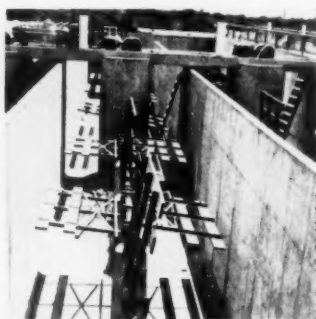
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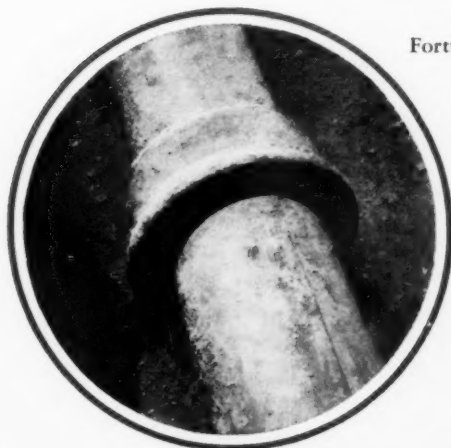


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CAST IRON

CAST IRON PIPE

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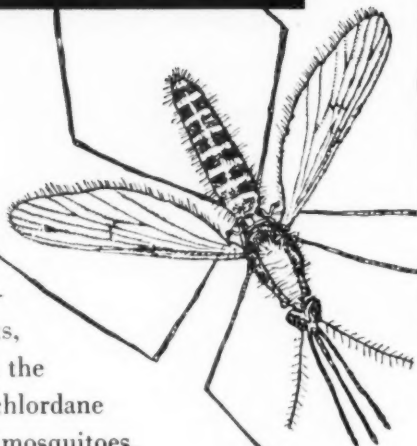
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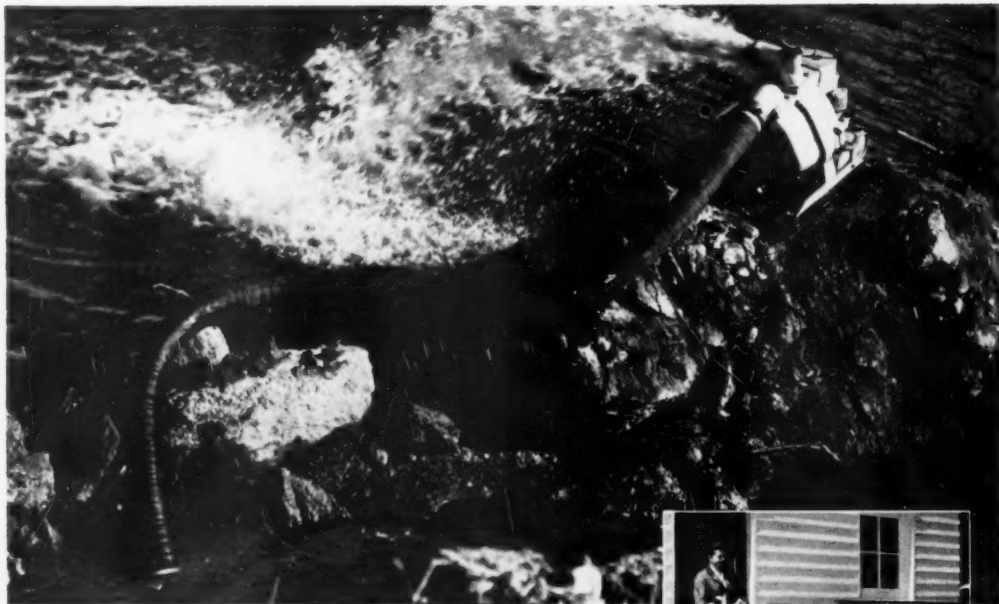
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PUBLIC WORKS Magazine



• CONSTRUCTING 66-inch section of the supply main, with Lock Joint steel cylinder pipe. This supply line was 48,000 ft. long.

Handling the CRITICAL MATERIALS PROBLEM in a WATER DEPARTMENT

It has often been said that it is an ill wind which blows no good, and such can be said of the present material shortages. The conditions that we now face will require each of us to study carefully our supply procedures and to search for new materials and methods by which to accomplish our work. We are all prone to become content with our own current way of doing things and to keep on that way until we are forced to meet the challenge of changed conditions. So, we will not spend much time in this article telling how to obtain priorities from our governmental control agencies, but will concentrate on the methods that are available to all of us, in our own back yard, to improve our supply situation.

The Dallas Water Department has the responsibility of operating and maintaining both the water and sewerage systems. Our water rates include a sewerage rate based on water consumption which finances

both utilities. No funds for capital improvements or operation are received from tax moneys collected by the city. In like manner, the Charter provides that water department funds can not be diverted to the support of general fund activities. However, we do provide free water and sewer service to municipal activities including the Park Department. In discussing the materials problem, therefore, both water and sewerage activities will be considered.

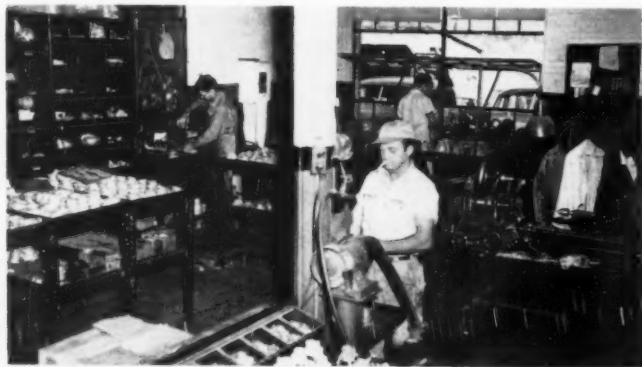
Planning Requirements

The heart of any materials problem lies predominantly in planning, purchasing, and use control. Planning for future needs is often akin

to gazing into a crystal ball, but when deliveries on materials are quoted at six, ten, twelve, or more months, estimates of requirements are in order. Small cities will face a more difficult problem than a large city in which organized purchasing departments and stores yards are available. However, all will have available from job records or invoices, approximate figures on the previous use of materials from which future requirements can be forecast. This should apply to maintenance materials and to materials for new connections. For a major program of expansion, a somewhat different problem is presented since bonds usually must be voted, priorities obtained from NPA, and a contract let before any steps can be taken towards the purchase of materials. The two problems here are so different in scope that we will restrict our discussions primarily to maintenance materials and small force account construction.

HENRY J. GRAESER,
Ass't Superintendent
Water Department, Dallas, Texas

The purchase of controlled materials for maintenance is covered by current NPA regulations, and allows a municipality to extend a MROU-8 priority without NPA approval. However, the amount of such materials which may be kept on hand is limited, so delivery must be scheduled accordingly on orders. A form is used by our stores department to keep a record of each delivery and issue, with a reorder point determined on the basis of delivery promised by the supplier. This of course, is applied to all materials, controlled or not, and is a most important point to be considered in meeting all materials problems.



● **METER repair shop overhauled 11,711 meters in past fiscal year.**

Careful and constant study of receipts, issues and materials on hand against current delivery dates is necessary to prevent future shortages.

To order ahead of requirements, which probably means increasing the amount of materials on hand, will present quite a problem to the municipal utility which **does not** have a reserve account for stores from which an increased inventory can be paid for upon arrival. It will become more and more necessary, however, to find ways by which these increased fund requirements can be met.

Purchasing Bases

The value of planned and intelligent purchasing can not be underestimated. In recent years even the smaller cities have realized the importance of establishing a purchasing department and combined stores for the various municipal departments. Any city of ten thousand people can well justify the establishment of these agencies. For smaller

cities, combined stores as well as combined purchasing is practical for all city activities. However, there comes a point in the size of the municipal organization where separate or departmental stores are necessary. At Dallas, we have long had separate water department stores since the majority of our requirements are peculiar to the water department and our volume of issue will support an adequate overhead. In fact our handling charges have been averaging only 4% since the war. Also, any disadvantage of separate stores is offset largely by combined purchasing. Materials used in quantity by all departments of the

future planning of the water and sewerage system is essential to an accurate estimate of future needs. For example, if real estate interests request an extension for new homes in any area of the city, you will not only have available information as to materials required for the immediate area to be developed, but can quickly ascertain what the ramifications may be as to major supply lines and treatment facilities. We found all too quickly here in Dallas that a 16-inch feed line for residential areas can only be extended so far before additional feed lines beginning at the source of supply must be looped into the area. So it pays to know where you are going and what extensions will mean to you. Also, we all know that certain areas of the city may develop faster than others. Your town grows north, east, west or south. Unfortunately, here in Dallas we are growing in three directions at once, though the expansion has been mainly to the north and the south.

With the aid of our master plan, we have been able to program, in our capital improvement bond issues, those major supply lines that can be anticipated; also, on the basis of the rate of home building in past years, to include what our requirements for area development will be. On this basis also, we have purchased considerable cast iron pipe and other materials for stores in advance of requirements to assure a ready supply of these materials when development does occur. This policy results in a real saving to the city since our contract price for cast iron pipe is not only somewhat lower than the market but city forces can be employed to construct small extensions which would have a high contract price because of their difficulty and scattered locations.

Detailed Future Planning

In addition to our master plan for a major arterial system for supply, we have continued to devote a considerable amount of time in our engineering department to more detailed future plans. In a rapidly growing city, advance plans are invaluable when a request by industry or real estate interests is received as to the cost of extending service to certain areas. Often these estimates must be made in a hurry and the industry concerned may be lost to the municipality if the proposition presented is not favorable. We are all familiar with the inherent

city is coordinated by the Purchasing Department to take advantage of price reduction on large quantity purchases. Likewise, procedures are established whereby the stores of any department can be purchased by another department through departmental invoices and transfer of funds.

The purchasing department, of course, has the added function of finding new and better materials and suppliers. Its staff constantly brings to our attention new products which we would investigate and place under tests. In shopping for bargains, you can not only save money but quite often find materials which are hard to get through your regular source of supply. It is well worth our time to look for these new sources of supply and constantly be on the alert for new materials to employ in our water and sewerage problems.

Long Range Planning

Equally important to the materials problem is planning. First of all,

danger of a quick proposition sometimes made to a desirable industry without adequate study of the problem. To know where you are going in the future can mean real savings as well as maximum utilization of materials.

In regard to the materials which all of us are finding so difficult to obtain these days for maintenance and construction, I would like to consider the use of alternate materials or substitutes. After the Korean situation arose, we began to search for other materials and place them under test. Every locality needs to make such studies as every soil and every water is a law unto itself—and you need to know with certainty, how a new material fits your conditions. We wish at least to establish the most desirable substitutes which we can employ to make up the deficits in our requirements when shortages of preferred materials occur.

The materials most everyone is having difficulty with these days are lead, copper, and steel. We have employed copper service pipe exclusively for many years in Dallas,

steel pipe for interior protection with a plastic tape wrap for exterior protection. We are also keeping in touch with the development of plastics which may be employed for service connections. The important thing is not how great is the initial cost, but what is the total ultimate cost of a service when it must be replaced. If you must select a substitute, spend extra money if necessary, to assure maximum service, and don't plan on replacement.

Substitutes We Use

We have, for a number of years, employed substitutes for materials now critical. For example, we cast our own meter boxes of concrete, employing a lid and ring of our own design procured from a local foundry. We estimate that these boxes cost us complete in the vicinity of \$3.55 each. Since our standard size meter boxes for $\frac{3}{4}$ -inch to 1-inch meters is 18-inch, this represents a saving in money and material. The major disadvantage, of course, is the weight which increases the cost of installation. However, the concrete meter box has proved satisfactory

test installations had been made, which appeared satisfactory. One test consisted of joining a string of about 200 ft. of 6-inch cast iron pipe on top of the ground. After curing, the pipe was filled and held at a pressure of 100 psi while a crane picked it up in the middle, raising the pipe two feet off the ground, the ends still resting on the ground. Then the ends were similarly picked up. The filled line was moved about and thrown out of line. No joints failed and no leakage occurred. As a result of those tests, the cement joint was adopted in August, 1941. Since that time no other has been used.

Making Cement Joints

The material is prepared as follows: Neat, screened portland cement is thoroughly moistened to such consistency that when a handful is squeezed the mass will remain in a lump in the hand, but when dropped six inches, will shatter (not spatter). The cement must be prepared in small amounts as it is needed. After the joint is yarned, the bell is filled with cement and then calked hard with a wide curved calking tool. However, the joint must be dry, as any leakage, wetting the cement, will make it impossible to calk. The filling process will have to be repeated four or five times, each time calking up hard. On the last calking, the cement will drive hard as would lead.



● **WATER** mains were extended to many homes to keep pace with growth and development of residential areas.

and have every intention of continuing this policy until such time as the material is no longer available. We have found that the corrosion resistance of this material far outweighs the cost. Galvanized steel or wrought iron is entirely satisfactory in many localities where corrosion is not a problem either from the soil or the water. It so happens that in Dallas both elements offer a problem. In considering possible substitutes, we are studying the use of cement lined

as far as service is concerned, once it is in place.

Of the critical materials, lead probably ranks foremost. This does not present quite the problem to us that it may to many cities since we have been employing a substitute for this material for many years with outstanding success. For normal bell and spigot cast iron pipe installations, we employ Portland cement joints exclusively. We first began the use of Portland cement joints in 1941. Prior to their use,



● **GETTING** ready to place the neat portland cement joints.

While making the joint, a piece of canvas is spread on the trench bottom under the joint to catch the large amount of material which will drop out of the bell. This may be scooped up and used in successive



● **CALKING** the cement grout into the pipe bell requires care.

refillings. When the bell is completely filled and calked, a fillet of plastic clay is applied to the front of the bell to protect the cement. If the joint has been carefully made, the pipe may be filled at once, but should not be put under pressure for at least three to four hours; and we prefer to leave the line out of service over night if possible. Where the run between valves is long, it is important that the joint be kept



● **PLASTIC** clay fillet is applied to cement joint for protection.

damp and cool, by means of an ample clay fill and by back filling at least a foot above the top of the pipe.

No Failures; Little Leakage In Joints

We have laid thousands of feet of mains in sizes from 4-inch to 36-inch with cement joints. Results have been uniformly excellent. To offer a specific example, we have laid 420 miles of 16-inch and smaller

since 1945 employing cement joints. No single joint has failed or developed leakage requiring corrective work. No pipe failure has occurred in any lines joined with cement. We find that there is some initial leakage which will take up in a few days and we allow the lines to stand under pressure for as much as a week if possible before applying the test.

Our present specification requires that the line when maintained under 150 psi for four hours shall show a measured leakage not in excess of 50 gallons per inch of diameter per mile per twenty-four hours. Most

portance of saving critical materials through planned maintenance, which is one of the more important factors in the operation of any water supply system. While preventive maintenance, and especially the paper work resulting therefrom, easily can be overdone, it is a program that every water utility should fully consider in the light of its own problems. Preventive maintenance programs are applicable to the smallest and to the largest water supply systems. Any such program should entail a system of written records to assure that maintenance procedures will be accomplished in

TABLE I—PIPE LEAKAGE TESTS

Duration Of Test: 4 Hours
Hydrostatic Pressure: 150 PSI

Pipe, Size	Length, Feet	Permissible Leakage	Measured Leakage
20"	4619	145.8 Gal.	13.0 Gal.
16"	1354	34.2 "	4.5 "
16"	1080	27.27 "	8.25 "
16"	3518	88.8 "	30.0 "
16"	5887	148.6 "	64.6 "
12"	835	15.8 "	12.5 "
8"	3202	40.34 "	7.5 "
8"	3320	41.83 "	4.0 "

tests result in less than half that rate of loss and we think that a limit of twenty-five gallons would not be too severe. Table I shows the results of some of our tests:

Cement makes such a good joint that on the few occasions a line has failed to pass the initial test, the trouble has been usually found at one joint, and most commonly at the top or bottom where calkers working on opposite sides of the pipe have failed to calk to the center. The trench must be kept free of water until the cement has taken initial set.

The one problem which we have in connection with cement joints is the fact that service cannot be restored as fast as with lead. By using Incor cement for fast setting, this can be speeded up. However, we appreciate the fact that, in an emergency, repairs, or a shut-down for a tie-in service, every minute counts and a delay of even three or four hours when customers are out of water is undesirable. For this reason we do employ lead in such instances and our demand for this material is considerable because of the size of our system.

In considering the problem of materials shortages, no superintendent should overlook the im-

properly and predetermined manner. Probably the best sources of information on preventive maintenance are the manuals for the operation and maintenance of water supply and sewerage systems published by the Repairs and Utilities Division of the Office of Chief of Engineers. These technical manuals are available to the public through the Superintendent of Documents, Government Printing Office.

It will be wise in every case to study these manuals with an eye to what portions of the procedures recommended can be abbreviated and applied to your particular situation. It will probably be found that many of the records can be reduced considerably, and that many of the maintenance procedures recommended can be reduced in frequency or eliminated entirely. As an additional reference, I would like to include a paper presented in the August, 1946, Volume 38, of the AWWA Journal by H. O. Hartung of the St. Louis County Water Company, St. Louis, Missouri.

Trouble When You Want It

Preventive maintenance is like prevention of disease. It will cost additional money to set up an effective
(Continued on page 126)



CIVIL DEFENSE

FOR NEW JERSEY'S WATER WORKS



LAWRENCE A. GREENBERG

Public Health Engineer

New Jersey State Department of Health

IN 1949, the legislature of the State of New Jersey enacted the Civil Defense Law of New Jersey creating the Division of Civil Defense as an integral part of the State Department of Defense.

The Governor is the head of Civil Defense in New Jersey. He is authorized by law to establish an adequate organization to control and direct all the resources of the State, and of its political sub-divisions, that may be necessary to cope with any conditions that may arise out of any emergency. Under the provisions of the law, the Governor has appointed a State Director of Civil Defense, who is authorized, in the name of the Governor, to exercise all the powers vested in the Governor by law in dealing with any

● **COMMUNICATIONS** are the nerve center. This is from "—And a Voice Shall be Heard", filmed by March of Time for GE.

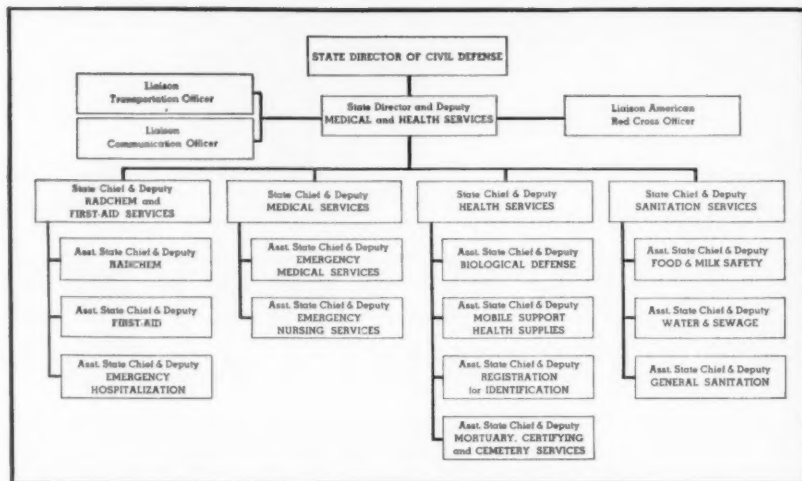
emergency resulting from enemy action or sabotage, or fire, floods, earthquake or other natural causes, when such an emergency is declared to exist by the Governor.

In order to provide decentralization of direction and to provide for coordination and more effective control, the State of New Jersey has been organized into four Districts and these in turn have been organized into a total of thirteen defense areas. A Director of Civil Defense has been appointed for the State, for each District and for each area by appropriate State Authority.

The State Director of Civil Defense has on his staff personnel in Charge of Police, Fire, Communications, and other activities including a State Director of Medical and Health Services. Similarly the District and Area Directors of Civil

Defense have on their respective staffs necessary personnel including a District or Area Director of Medical and Health Services. The State Director of Medical and Health Services is the Commissioner of the State Department of Health. The State Director of Medical and Health Services is a member of the Executive Committee of the State Civil Defense Council and a member of the Staff of the State Director of Civil Defense. He in turn has on his Staff with a State Chief and Deputy for each of the following: Radchem and First Aid Services, Medical Services, Health Services and Sanitation Services. The State Chief on Sanitation Services is the Director of the Division of Environmental Sanitation of the State Department of Health and has on his staff Assistant State Chiefs and

● CHART of New Jersey's Civil Defense Or- ganization



Deputies on Food and Milk Safety, General Sanitation, and Water and Sewage.

At the present time approximately ninety key persons have been selected on the State, District, and Area levels of the Sanitation Services Program. The Assistant State Chiefs and Deputies are members of the Staff of the State Department of Health. Personnel for the District and Area level have been drawn from the District and Local Health Offices and in the case of Water and Sewage the key positions have been filled by the superintendents and engineers of New Jersey's water and sewerage systems.

The New Jersey Division of Civil Defense has recently published the New Jersey Plan for Emergency Medical and Health Preparedness. In the foreword of this document, Mr. Leonard Dreyfuss, State Civil Defense Director, has said: "In my judgment, there has been no time in American history when it was so necessary for citizens to participate in our country's defense plans. The task of the emergency medical and health services is a vitally important one. The people who volunteer not alone help their community, but become an integral part of our nation's protective services."

Sanitary Services Program

The Sanitation Services Program is set forth in Chapter VII of the New Jersey Plan for Emergency Medical and Health Preparedness. The overall objectives of the program are the strengthening of the defenses of food and milk establish-

ments and of water and sewage works against sabotage, warfare or other emergency; to increase and strengthen community sanitation resources against sabotage, warfare or other emergency; and the development of a program of mobile support for the emergency, rehabilitation and maintenance of sanitary works and environmental sanitation. In brief, the functions of the various levels under the plan are planning at the State level, promoting and advising at the District and Area levels, and execution at the local level.

A technical Manual on Water and Sewage has been completed and when it has been co-ordinated and integrated with the other programs it will serve as a basis for carrying out the plan. The aforementioned program is as follows.

Owners and operators of water supply systems must take all precautions necessary to prevent and to withstand emergencies so that maximum use can be made of the undamaged parts of the system and so that its rehabilitation can be expedited. Alternate sources of water will be selected in advance and provided for wherever possible. Possible interconnections with other supplies will be investigated and made where feasible. Stand-by auxiliary power units for operating treatment plants and distribution systems will be made available in case an overall power failure requires their use.

Key personnel from the larger water supply systems in North Jersey have worked together through

a "Joint Operations Board" under the general supervision of the Water Policy and Supply Commission in providing interconnections between the water supplies in North Jersey to provide maximum protection and flexibility in planning and advance preparation for any emergency. This board will work in close cooperation with the Civil Defense Program in planning and establishing advance arrangements for water service throughout the State. In fact, practically all members of the "Joint Operations Board" are key personnel in The Sanitation Services Program of Civil Defense.

Water Systems Mapped

An up-to-date civil defense map of each water supply system showing not only the pipe lines and sizes but all valves, cross-connections, interconnections, pumping stations with power and pumping equipment, storage units, surface and underground sources and dam sites will be prepared. All parts of the system that might be important in case of emergency will be shown. The main grid system will be made to stand out in the drawings to facilitate use by substitute personnel and for quick planning during the emergency. The maps and data will be protected from possible saboteurs or unauthorized persons.

Because of the joint use of the distribution system for drinking water and fire fighting, sound working relationships are to be established between water works and fire fighting personnel. Each must appreciate the requirements of the



● LONDON had problems like this in World War II. (BIF)

other. They must work together to provide water for fire fighting without causing disease outbreaks. It may be necessary to order the boiling of all water or to isolate a part of the system for the use of an unsupervised source of water for fire fighting or to provide special treatment to the water under emergency conditions.

Consideration will also be given to the possibility of a complete breakdown of the system and the need for transporting potable water in tank trucks. Plans are to be worked out for the use of trucks and/or tank cars for the proper cleaning and disinfection of such equipment before use. The aforementioned technical manual recommends types of trucks to be used and method of cleaning and disinfecting these tanks.

Each water works must make plans to increase the chlorine residual immediately in an emergency which may have damaged the water supply system and maintain the higher concentration until the system has returned to normal. Consideration will be given to establishing necessary additional chlorination stations on large distribution systems. An inventory of emergency disinfection equipment will be made readily available.

Among the many problems presently facing those responsible for the quality of public water supplies, none is more difficult to appraise and to attack than that of radiological, biological or chemical contamination. Of prime consideration are the questions of the "probabil-

ity" and of the "possibility" of such pollution. This paper will be restricted to the question of "possibility" for the reason that the intelligent defense of America involves organization against any possible form of attack. Our water supplies may be radiologically, biologically or chemically contaminated either through or as a result of direct or overt enemy action or by sabotage.

Contamination Sources

Contamination of our water supplies could follow bombing attacks because of: (a) breaks in water mains and sewers, allowing gross contamination of the water distribution system with sewage; (b) back-siphonage from building fixtures due to reduced, zero, or negative pressures in water mains in the disaster or nearby areas; (c) pumping of water from unsafe sources into the system for fire fighting purpose; (d) destruction of sewage treatment plants resulting in the discharge of untreated sewage and industrial wastes into our potable waters; and (e) damage to industrial plants.

As has been pointed out, the use of the conventional high explosive type bomb can result in the bacteriological and chemical contamination of our water supplies. The advent of the atomic era, with the bombing of Hiroshima and Nagasaki, has introduced a third potential type of pollution, that of radioactivity.

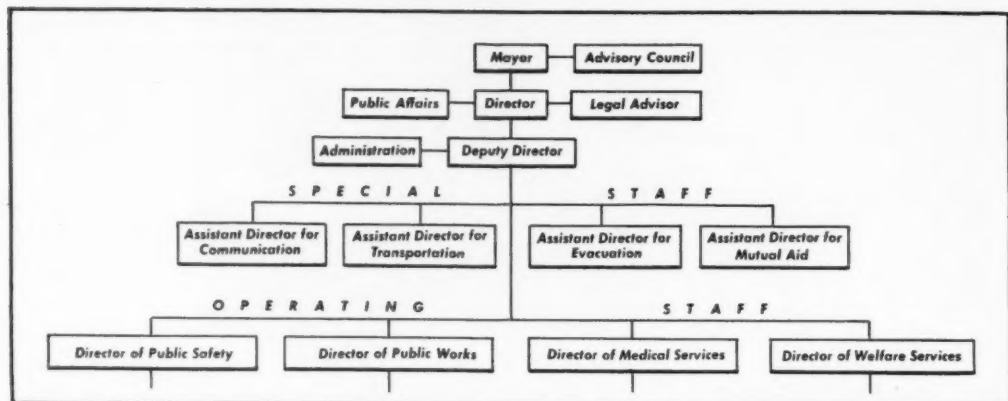
The atomic bomb produces its maximum destructive effects when exploded as a high air burst or at approximately 2,000 feet. When ex-

ploded at this altitude, there would be no serious contamination of water supplies in reservoirs, or in treatment plants and other parts of the water supply system. Such radioactivity as would appear from "fall out" would be small. Low air bursts, ground, underground or underwater bursts produce varying degrees of residual radioactivity, but such bursts produce less damage from heat and pressure.

A surface or underwater burst might produce very heavy contamination of water supplies in open reservoirs, for example. The hazards from this contamination might be serious enough temporarily to preclude the use of the water for drinking and cooking, for dressing open wounds, and for industrial uses that might transfer the radioactivity to products that would be eaten, worn, or used by the public. The length of time that the contaminated water would be unusable would depend on the distance of the water supply from the bomb burst and on the severity of contamination spread by fall out and base surge. One safety factor in the ingestion of radioactive particles is normal radioactive decay. A second factor is the tendency of most fission products to pass through the body quickly, producing little, or no damage. In addition the radioactivity of water drawn from contaminated surface supplies may be reduced or removed by the usual processes of sedimentation, coagulation, and filtration. However, even at low levels of radioactivity, prolonged and repeated

(Continued on page 144)

How TOLEDO developed a



● **ESSENTIALS** of Civil Defense organization for Toledo are shown in the above chart, with duties of special and operating staffs.

JOSEPH F. MORE,

Director of Civil Defense, Toledo, O.

NOTWITHSTANDING the lack of adequate national support, we in Toledo have made substantial progress in the development of a practical civil defense organization. I would like to stress the word "practical" because practicability permeates our entire organization. This principle was also a guiding influence in the drafting of our basic plan of organization which was published in the April, 1951, issue of **PUBLIC WORKS**.

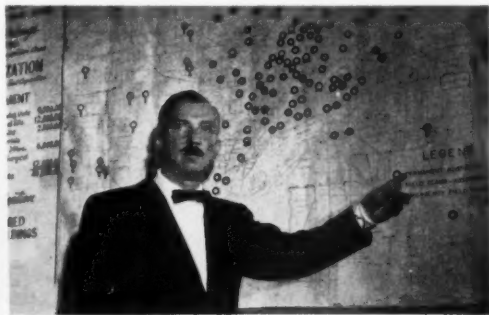
Almost as my first act as director was the introduction of a civil defense program into our schools,

working through a strong committee of school officials and representatives of the Parent-Teacher Associations and of the City Police and Fire Departments. Pupils were instructed in the principles of "Survival Under Atomic Attack", using the Government booklet of that title as source material. We did not have funds to purchase the booklet, so we asked the *Toledo Blade* to publish it serially. The serials were clipped and used as text. Our school buildings were inspected and the best shelter areas were selected. Through drills, which continue, children have been trained to go to such areas in case of Red Alert.

We had a few teachers who had been qualified first aid instructors. They were given a refresher course by the Red Cross. From this, there mushroomed an extensive first aid program. By the end of the school year, we had two or more teachers in every school who were qualified in first aid. Instruction in first aid was introduced also into some of our high schools, with seniors participating in the training. Procurement and storage of basic first aid supplies in the school buildings followed. In our plans, we provided for post-attack evacuation of children. In this, the guiding policy is that in case of disaster, children should be reunited with their par-



● **MOTORCYCLISTS** line up for registration.



● **MEDICAL** field unit is headed by Dr. Snyder.

practical CIVIL DEFENSE ORGANIZATION

ents as soon as possible. Evacuation would be under the supervision of teachers. Children, whose homes were in the area of destruction, would be directed to predesignated shelters.

This program necessitated an overall plan, as well as a specific plan and organization in each school. Included also is a basic plan of communication. Using the chain telephone method, a signal received at the office of the Board of Education can be transmitted to all the schools in a few seconds more than two minutes. Pending the procurement and installation of a warning system in the city, coded signals are used for alerts.

Divisional Directors

The selection and appointment of directors of our various divisions was not only an extremely important phase of implementation but it was also a difficult task. In our four operating divisions, we called upon the heads of corresponding departments in the city administration. However, we have several other major divisions; and in the major divisions there are numerous sections and subsections. We needed people with special qualifications, and a considerable number of them with technical background. In the present defense economy, it is difficult to find people who possess the necessary technical or special qualifications, including leadership, and who can devote a substantial amount of time to volunteer work.

Next came an appraisal of our resources. Here, I received several

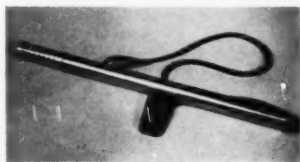
jolts. Our regular fire equipment is hardly adequate to deal with a series of fires which could result from a small scale incendiary attack. An atomic attack, either alone or combined with the use of incendiary missiles, which would be likely to result in fire storms, would render us quite helpless. We need additional fire equipment, at least enough to double our present resources. We have trained only one class of auxiliary firemen so far. I am certain, however, that we can obtain additional volunteers when

our engineering equipment into units. However, because such equipment is frequently moved from one area into another, such an organization is not practical. Accordingly, we have designated sectional assembly points where such equipment would report in case of disaster, and from where they would be dispatched to the disaster area.

Medical Problems

Last year I attended a civil defense staff exercise in Philadelphia. In the solution of the hypothetical problem, the medical resources proved to be inadequate to care for all the casualties. I was informed that there were 5,000 doctors in Philadelphia. In comparison, we have less than 500. Admittedly, an atomic bomb could cause more casualties in Philadelphia than in Toledo, but not too many more if the attack were in the heart of the city in each instance. Our urban area is smaller, but our concentration of population is rather high. We are organizing to do the job with less than 500 doctors.

Here, I think, we found a plan which provides for a highly efficient and effective utilization of our medical resources. I believe it is worthy of a detailed explanation. The plan was originated by the Civil Defense Committee of the Toledo Academy of Medicine, under the chairmanship of Dr. Richard Hotz, who is deputy director of the medical serv-



● GEIGER counter made locally.

more fire equipment is made available. Unfortunately, we lack funds at all levels of government for the purchase of such equipment.

Our engineering equipment is also limited. In this, however, a fortunate circumstance is that engineering equipment is well dispersed and, generally, outside of congested areas. Our plans provide for the dispersal of fire equipment on yellow alert, but attack may come without any warning whatsoever. I should like to have been able to organize



● AIR transportation is an important element.



● WOMEN'S organization learn about civil defense.

ices division of both the Toledo and Lucas County civil defense organizations. The organization is in three phases.

Phase I provides for the enlargement of the professional staffs and facilities of existing hospitals to more than triple normal bed capacities. This was projected primarily for mutual aid, to care for possibly several thousand wounded from nearby stricken cities in case we escaped attack. This phase is rather well organized, and it is not costing the city anything.

For disaster rescue operations in the city, we are now developing a

medical field organization, under the direction of Dr. Roscoe H. Snyder. This is Phase 2. It is remarkable I think, in concept, in planning, and in the support it is receiving from the people. The plan called for the formation of 103 Medical Field Teams, dispersed throughout the city. It also called for the procurement of certain basic equipment and supplies. The mission assigned to each team is to prepare the seriously wounded for evacuation and actually to evacuate them to emergency field hospitals where definitive treatment can be administered. Here, we have two

important factors worthy of note in civil defense planning.

First, we would evacuate the wounded from the disaster area direct to hospitals. We do not plan on handling the wounded through elaborate evacuation centers, for two reasons: First, we believe that the seriously injured should be taken to hospitals for definitive treatment as quickly as possible. Secondly, we do not have medical personnel to staff such evacuation centers. It is probable, however, that even if we had two or three thousand physicians we still would utilize our present plan of organization.

The Medical Field Team Organization

Last October, we decided on the table of organization. Each team must have one physician, one dentist, two nurses, one nurse's aid, one pharmacist and 75 lay personnel. The operating team needed only 25 lay men and women. However, it was deemed advisable to organize them three-deep. We should like to have done the same with the professional personnel, but we could not spare them. We also realized the value and essentiality of the clergy in disaster rescue operations, so we provided for two to three clergymen for each team.

This called for a large scale organization, directly involving some 8,000 men and women. Our medical people already were pretty much in the civil defense picture, as were our clergy. Those we could reach. We needed more than 7,500 lay volunteers to be recruited when civil

defense generally was not being supported very strongly.

Dr. Snyder and I met with a small committee from the Council of Parent-Teacher Associations, headed by Gordon Jeffrey, and later with the schools' civil defense committee. We asked them to co-operate in a program of securing 75 volunteers for each Medical Field Team, and also to provide, for each team, 8 litters, 200 bandage pads, 200 triangular bandages and a set of splints, all home made. In addition, blankets, flashlights and certain hand tools would be brought to the assembly point by members of the team in case of actual disaster. The program was accepted.

Next, we called a meeting of presidents of Parent-Teacher Associations and similar groups. Again the program was spelled out and was accepted. That was last Novem-



ber; and by that time the Girl Scout and Boy Scout organizations also entered into the picture.

Then, I drafted a letter, co-ordinating it with all concerned, to be sent to all parents, through the school children. In this, the co-operation of E. L. Bowsher and Msgr. Norbert Shumaker, superintendents of public and parochial schools, respectively, was a far reaching influence. We mimeographed and distributed 54,200 copies of the letter which outlined the project and asked parents to volunteer their services.

In three weeks, the first unit was fully organized and its litters, bandages and splints were made. By the end of February, the program was one-third implemented. A number of other teams had sufficient volunteers but were not yet completely organized.



At the same time, the medical staff started briefing the doctors and dentists in the handling of casualties. Instructors were specialists in the various aspects of emergency medical treatment. Next came the nurses and other professionals. At a meeting held in February, nearly 500 doctors, dentists, nurses, pharmacists and clergymen attended a briefing session. For instruction purposes, Boy Scouts, in bathing suits, were made up to simulate the various types of injuries.

Training of lay personnel is very brief. On each team we have a supervisor, a supply supervisor, a

personnel supervisor, a communication man or woman, two ambulance drivers, a clerk, 8 litter bearers and 10 men and women in the personnel pool, all organized three deep. The assigned tasks, while extremely important, require little training.

We are projecting a supplemental organization for the handling of light casualties. This is a series of first aid stations, to be established around industrial plants with dispensaries, and at drug stores scattered throughout the city. These will be manned by people trained in first aid. We do not have enough physicians available for assignment

to such aid stations, but these are intended to take care only of minor injuries. Industrial plants and drug stores have been chosen as aid stations because of availability of basic first aid supplies in such installations.

Phase 3 of our medical plans was projected to establish emergency hospitals. An extensive building survey, made by the Red Cross, indicated that 38 such buildings would meet the requirements and 4 others were probably suitable, so the organization, under Dr. Harry A. Burstein, of the Toledo Academy of

(Continued on page 112)

Training Lay and Professional Personnel

Faster Repairing for 9,000 Street Openings

PAUL MacMURRAY Chief, Bureau of Highways, Philadelphia, Penna.

REPAVING of cuts made in Philadelphia streets for water main and sewer repairs is big business. Some 9,000 such cuts are made annually, requiring the replacement of 30,000 square yds. of pavement; and the handling of an average of 1 cubic yard of dirt per opening—a total of 9,000 cubic yards. Replacing base and/or pavement over such cuts requires 33,000 bags of cement a year. All things considered, this is big—and costly—business.

We have developed equipment, including a repaver to expedite this work, reduce interference to traffic and save costly and scarce manpower. A Holmes loader and bin, mounted on a truck; and a mobile

truck-towed repaver unit are the principal items of equipment we use on this work.

Dirt from the ditch is hand-shoveled direct into the Holmes loader, avoiding the necessity of rehandling the dirt to the street and then into a truck. This has cut two men from the 7-man crew formerly required—a pneumatic tool operator, 2 diggers, 2 shovelers and 2 drivers. This method also avoids piling dirt in the street with the consequent necessity for cleaning up.

To handle the repaving work, we have developed a repaving unit. This is a 2-bag mixer, trailer mounted, as shown in the illustrations herewith. This mixer-trailer is equipped with a tank holding 50

gallons of water, which can be refilled at any hydrant. The 4-cylinder engine which operates this mixer is equipped with a self-starter. A measuring box on the towing truck holds 1¼ cubic feet of aggregate, and the aggregate is fed from the truck to the mixer by a metal chute 18 inches wide and 4 inches deep at the upper end. The standard mix for concrete base is 1:2½:5. The truck is loaded twice a day with 16 bags of cement, plus gravel and sand, for which separate compartments are provided.

This unit speeds up the work and avoids the necessity for mixing concrete on the street surface with its consequent cleaning up problems, both before and after mixing.



● TRUCK, front-end loader and bin (in truck body) comprise an efficient street repair unit.



● ONE of four units, which include truck, chute and mixer, for repaving street openings.

SMALL SEWAGE TREATMENT PLANTS IN NEW ZEALAND

THE standard of sewage disposal in New Zealand is low. At present the only modern treatment plants are those built by the Works Department for military camps and defense installations; a few built since the war for Government communities and institutions; one built for a large industry and one or two small municipal plants. Some major municipal treatment plants are now being planned.

The Works Department has the responsibility for designing sewage disposal works for its depots and construction camps, and for other Government communities such as defense camps, mental hospitals, prisons and radio stations. Many of these are small and this article mostly deals with the population range of 50 to 500.

For these small communities the cost of sewage treatment per head is high and particularly for those communities with populations of 100 or less the use of earth closets, tube privies, chemicals closets, and individual septic tanks would be considered before deciding on a sewer with primary or complete treatment.

At all places a separate system

R. C. Lough,
Assistant Designing Engineer, Works
Department, Wellington, New Zealand.

has been adopted so that domestic sewage only has to be treated at plants. There are not much data available as to strength of sewage in New Zealand. Sewage flows for these small communities may range from 40 to 100 gallons (Imp.) per head per day. BOD is approximately in the range of 125-350 ppm. or 0.12 lb. to 0.17 lb. per head per day, depending on the type of community or institution. Suspended solids would show rather larger figures.

Types of Plants

The design of these small plants presents as many and as difficult problems as the design of much larger ones. The type of plant adapted so far consists of an Imhoff tank with trickling filter and humus tank. In these small plants the sewage arrives at the plant fresh and the use of Imhoff tanks instead of septic tanks results in the sewage passing through the

plant in fresh condition with better performance of the filters. Sludge drying beds are used, and in a few cases effluents require chlorination. Typical plant layouts are shown herewith.

Some primary plants have been built and are being built. These consist of Imhoff tank and sludge drying beds with, in some cases, a screen chamber. A water supply is provided at each plant for hosing down and general cleaning. An intermittent sand filter will be built soon.

Design of Units

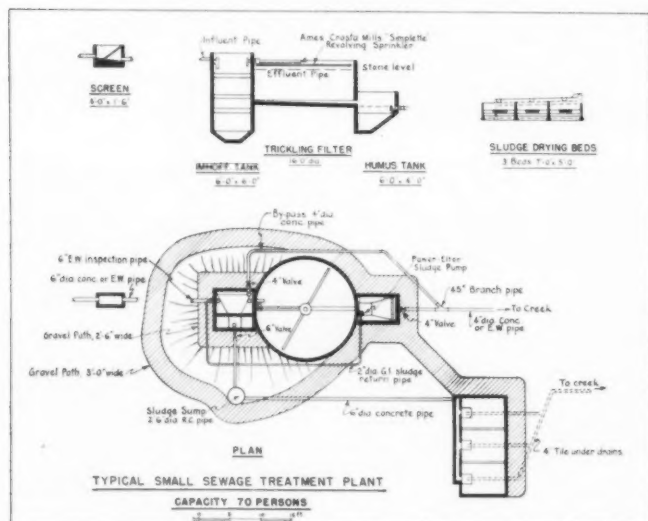
Bar screens have been installed in some cases. Experience to date indicates that they might be dispensed with.

Imhoff tanks are usually designed for 3 hours detention at average daily flow and for sludge capacities of from 3 to 4 cubic feet per head, depending on size and climatic conditions. Depth is important for sludge digestion and the tanks are made as deep as possible yet allowing suitable proportions of the sedimentation chamber and avoiding excessive cost. The tanks shown herewith are rather shallow and wherever possible greater depths are now used.

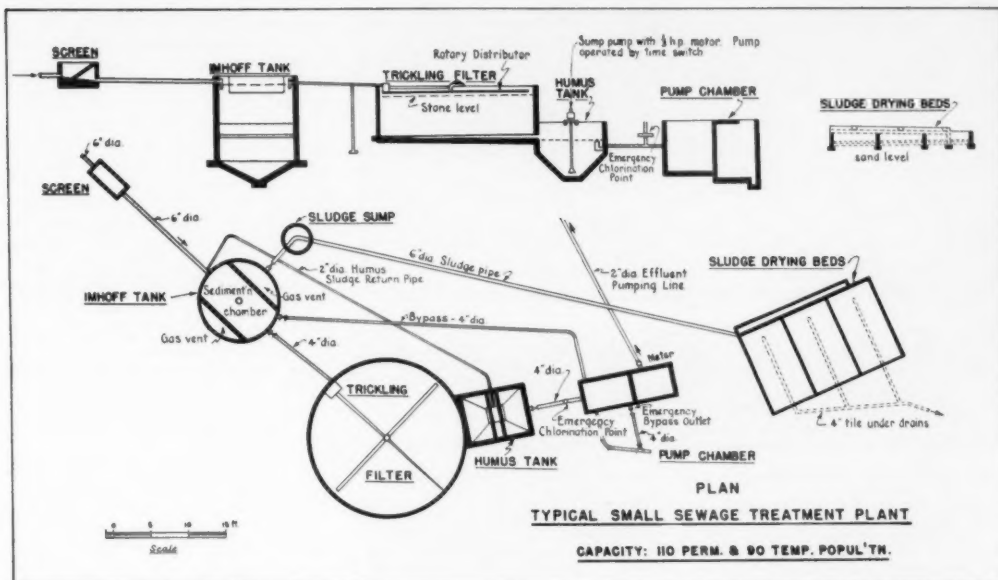
Circular tanks are used down to 12 or 10 feet diameter. Square or rectangular tanks are used up to about 12 ft., longest side. Formwork costs are high for circular tanks but deep rectangular tanks require a larger volume of concrete than equivalent circular tanks.

In difficult ground conditions, excavation for Imhoff tanks is a big factor and it may be necessary to use a shallower septic tank. Wherever possible Imhoff tanks are located with only part of the depth in the ground, and the upper part surrounded by fill.

In one tank constructed recently for a temporary construction camp with population of about 350 the sloping and vertical sides of the sedimentation chamber are made of 3/4-inch thick flat asbestoscement



● IMHOFF tank and trickling filter layout for 70 persons



● **PLAN and section through a medium sized plant with Imhoff tank, filter and final settling tank.**

sheets. The sheets are supported on a framework of welded 2" diameter galvanized pipe and this framework is supported from the tops of the tank walls. This eliminated the most difficult part of the formwork and placing of concrete. It is not unlike the type shown in "Public Works" of February 1949, page 23. The life of this construction will be followed with interest.

In very small tanks cast iron tees for inlets and outlets are used. In rather larger ones inlet tees with outlet and weirs are used and should give better performance. Some tanks built recently have Hubbell type inlets similar to those described in Sewage Works Journal Vol. VI (1934) p. 774.

Sludge is discharged to the drying beds from the Imhoff tank by hydrostatic pressure.

Trickling Filters

Trickling filters are designed on the basis of 0.25 to 0.27 lb. of BOD per cubic yard per day after assuming a 30% reduction of BOD in the Imhoff tank. The filter beds are usually made circular and of reinforced concrete. Wherever possible the stone depth is 6 ft., but where head available is insufficient this may be reduced to 5 ft. or even 4.5 ft. The stone is usually graded from 1½ to 3-in. and the sodium sulphate

soundness test is applied to samples of stone wherever necessary.

Rotary distributors are used and so far all the plants have been equipped with Messrs. Ames, Crosta, Mills Ltd., "Simplette" water-wheel type distributors.

Underdrainage has proved a problem as the special filter floor tiles made in USA and England are not available here and, on account of the demand for their products for housing needs, the brick manufacturers have usually not been able to supply half round tiles of special design so ordinary bricks (8" x 4½" x 3") have been used. In most cases there is, at the end of each brick drain, a vent through the wall for ventilation and for easy flushing of the under drains.

Where the Imhoff tanks, filter and humus structure are built monolithically, and an earth fill is placed around the Imhoff tank, it is not possible to provide vents in the wall. In such cases a drain is formed around the periphery of the tank interior into which all the drains connect. Over this peripheral drain there are vertical riser pipes to provide ventilation and for easy flushing of underdrains.

Other Treatment Units

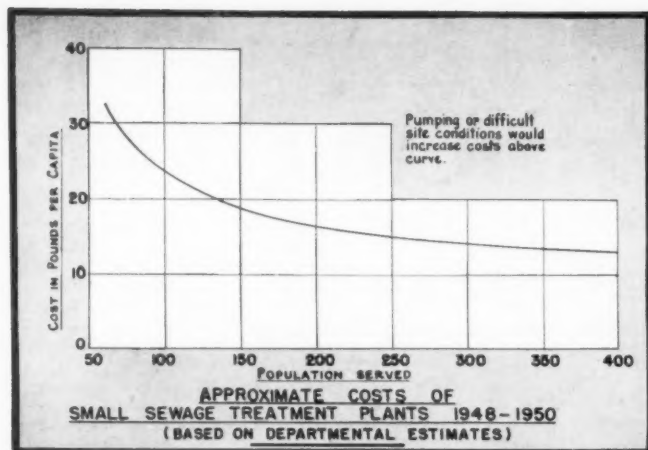
Humus tanks are usually designed for about two hours detention at average daily flow plus a small

extra volume for sludge accumulation. The very small tanks have cast iron tee outlets but others have a full width weir overflow.

It is important that the accumulating sludge be removed frequently and regularly from the humus tank and in most instances the human element is eliminated by using a small suspended type centrifugal pump, electrically driven and controlled by a time switch to operate it for a short time each day. The operating period can be varied to suit requirements. This humus sludge is returned to the Imhoff tank inlet for digestion along with the primary sludge.

In a few cases disinfection by chlorination has been necessary to meet the requirements of the Health Department. A small chlorinator, handling chloride of lime solution, sodium hypochlorite or calcium hypochlorite has been used at one site. This chlorinator has an adjustable drip feed which is controlled by a lever arrangement from a float. The range of float travel is controlled by passing the humus tank effluent through an orifice. This is still somewhat in the experimental stage, but it is believed it will prove satisfactory.

Sludge drying beds, on a small scale, follow the usual type adopted for larger works. The area of bed ranges from 1 to 1.5 square feet per



● COST data curve, based on number of people served by plant.

head, depending on location and climatic conditions. Usually 3 beds are provided for the smaller plants and 4 for the larger. These have thin concrete or brick dividing walls, tile underdrains, sand bed about 4 inches thick and gravel averaging about 6" deep below the sand.

Location and Pumping

With no previous experience of these small plants in New Zealand, there was no guide as to how close to residences they could be safely located. Advice from the Ministry of Health in Britain was that 50 yards was a desirable distance but 50 feet was a minimum. Information was also sought from the Minnesota State Department of Health who have had experience with this type of plant and their advice was that 100 feet was the minimum. Until further experience is gained here, efforts are made to locate plants 300 feet from residences but this cannot always be obtained and in one case it has had to be reduced to just under 100 feet. Wherever possible plants are located so that gravity flow right through is possible. Adequate fencing of plants is essential to keep children out.

Pumping of raw sewage to these small plants presents so many difficulties that it is avoided wherever possible. The smallest raw sewage centrifugal pumps available here have capacities of not less than 80 to 100 gpm, which is many times the usual average rate of flow. It is important to feed the raw sewage to the sedimentation compartment and filter as uniformly as possible and this necessitates the use of pumps

of much smaller capacity than those quoted above. The smallest raw sewage pneumatic ejectors can deliver at as low a rate as 25 gpm. and even this is too high for very small plants. These pneumatic raw sewage ejectors are very expensive.

To maintain satisfactory dosing of sedimentation tanks and to keep cost within bounds it is necessary wherever possible, to bring sewage to the sedimentation tanks by gravity, then pump the effluent up to the filters. For effluent pumping, suitable and relatively inexpensive pumps are available.

Costs have risen considerably during the past few years. The chart herewith shows in a general way the costs per head for various sizes of complete treatment plants. Estimates prepared for small aeration plants indicate that they would be rather more expensive than the type of plant described in this article.

The operation of these small plants is being followed up and operating practice is being checked. From time to time analyses of raw sewage and effluents are being made.

While operating data is rather limited as yet, it is clear that with proper operation a good standard of effluent can be obtained. Operating data is available for two plants for over one year. The operating record of a plant which is at present serving about half its design population is most satisfactory. This plant receives very good attention.

Liming of sludge compartments is necessary at intervals at some plants. Depending on size and type, operation and maintenance should require from 4 to 8 hours a week.

Garbage Reduction at Indianapolis, Ind.

Indianapolis is one of the few cities in the world which operates garbage reduction plants for the purpose of processing garbage into salable products. The collected garbage—averaging about 60 tons per day, with a maximum of over 100 tons per day during summer months—is dumped into a concrete receiving pit. It is then moved by conveyor and discharged into 32 vertical steam-jacketed pressure cookers, each holding about 3 tons.

After the garbage has been cooked, the top lid of the cooker is opened and the steam is left on in the jacket until the garbage is dry. The dried garbage (tankage) is then conveyed to the grease-extraction room where it is put into large tanks, and the grease is washed out with naphtha. The dried garbage contains from 18% to 20% grease, and it is possible to remove all but about 1% of the grease by this naphtha extraction method. The naphtha is evaporated, condensed and stored for further use; and the grease, remaining after evaporation, is pumped into a grease-storage tank. Any naphtha that remains in the tankage after washing is driven off with heat and live steam; condensed, and also discharged into the naphtha-storage tank. The de-greased tankage is then conveyed to the feed and fertilizer room where it is screened. About 40% can be separated into feed and 60% into fertilizer base. Revenue from the sale of these products will pay the garbage plant operating costs when prices are good. The grease is sold to candle and soap manufacturers; the fertilizer-base to fertilizer manufacturers and the feed base is usually sold to feed makers who mix it with other ingredients to produce a more completely balanced feed.

Cost and Returns

In 1950 the crude tankage per ton of green garbage averaged 441.1 pounds, of which 337.7 lbs. were used for fertilizer; 13.0 lbs. for feed; and 87.9 lbs. were grease. The total amounts sold were: Fertilizer, 3,963.5 tons for \$37,606.80; feed, 151.6 tons for \$3,787.50; and grease, 2,842.9 tons for \$63,456.82. The revenue totaled \$104,851.12. The cost of operation was \$254,883.44, of which \$103,877.66 was for labor, \$31,593.84 for materials, and \$119,411.94 for power.

CUTTER and CHIPPER reduce ROAD BRUSHING COSTS

MALCOLM MacPHERSON

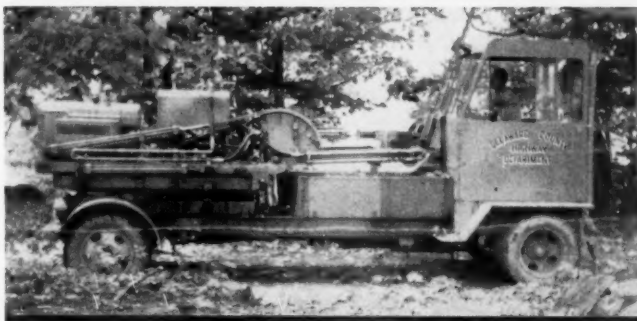
County Sup't. of Highways, Delaware
Co., N. Y.

TWO new machines were purchased by this Department in 1950 for use in control of brush along county and town roads. These machines have been very satisfactory and provide a solution of a problem which is paramount in most highway departments. While the machinery was purchased for and has been used on both county and town roads, the primary purpose was to help the towns overcome their brush problems.

Beginning in 1946 this Department began a program of cutting and spraying brush along the highways comprising our county road system. During the six seasons since then we have been very successful in bringing in a good growth of grass along most of our roads and have very few roads that give us much trouble in keeping heavy weeds and brush under control. This program has been expensive, as all cutting was done by hand labor. We found that the disposal of cut brush by burning is hazardous and probably as expensive as the actual cutting operation. We believe that the expense of this program was justified by the results obtained, but we have also felt that some form of machine cutting would give as good results and be more economical.

During this same period the towns in this county had not been able to cope with the brush along their highway systems. Almost no brush had been cut during the war years, and essential work on the roadways and bridges absorbed most of the available labor for some time thereafter.

In many cases the growth had become saplings, or even trees, starting at the very edge of the



● **BRUSH** cutting unit operated by Delaware Co. Highway Dep't.



● **CHIPPER** at work. Brush is fed into the hopper at rear.

Photos by John A. Manbeck, Mott-Manbeck Machinery Co.

beaten path; and in some cases overhanging the track itself, making the roads unsafe because of limited sight distance, to say nothing of the many other reasons apparent to everyone responsible for highway maintenance. So it was with this condition in mind that equipment for the cutting and disposal of brush was purchased.

This equipment consists of a Hall-Holmes Brush Cutting ma-

chine and an Asplundh chipper. The brush cutting unit is mounted on a specially designed self-powered chassis, built up principally from Ford truck parts. In roadborne position the machine is no wider than the ordinary truck, and can travel over the road at usual highway speeds. The cutting unit is powered with an independent International V-2 power unit and is entirely hydraulic-operated by

means of remote control from the cab on the rear of the chassis. Thus one operator controls movement of the vehicle and the cutting operation simultaneously.

In operation the cutting unit is swung at a 90 degree angle from the chassis. The 6-foot cutter bar operates in any position within a 170 degree vertical angle from the end of the boom. The boom is so hinged that the cutter bar can operate over fill slopes in back of guide rails or parapets. The boom will extend so that brush can be cut up to a maximum of 18 feet from the shoulder of the road. The cutter bar is of conventional type

This equipment is operated from our Delhi, New York, headquarters, but because our county is large and the jobs are often at some distance from this headquarters, the machines are left at night at any convenient place adjacent to the job and the operators travel to and from work in the pickup truck used to haul the chipper. This truck also carries supplies and spare parts for both machines. When operating on town highways the two machines, a pickup truck, and two operators are furnished by the county. The extra help necessary to put the brush through the chipper are local men furnished by the town. We

nothing more need be done with it. There is no fire hazard, no additional labor to keep fires and no night watchman. All that is left are some chips along the side of the road. The chipper is just about the right size in that it will dispose of the brush that the cutting machine will cut in any given period of time. I know that such a machine would have paid for itself several times over if we had been using it while hand-cutting our county roads.

This brush cutter will cut brush up to 3½ inches in diameter, but we have found that our operation is more economical when hand labor cuts anything larger than 2 inches in diameter ahead of the machine. With brush not larger than 1½ inches this machine will cut almost as efficiently, although not quite as rapidly, as a conventional mower will cut grass and weeds. The chipper will dispose of sticks up to 6 inches in diameter, but we have made it a practice to leave anything larger than 3 inch along the roadside for future disposal, and chip up only the limbs and tops. Operating within these limitations makes for a more efficient operation of the machines.

One question often raised is that of results—that is, will the machine leave long stubs, or is it possible to cut close to the ground? That is largely a matter of evenness of the roadside to be cut. If the slope is full of rocks or humps, large stumps and fence posts, results are not as satisfactory. But if the slope is fairly even and regular, the machine will cut brush close to the ground and do a very even job. As one of my Town Superintendents put it—"It won't cut brush as close as men can cut, but the machine will cut as close as they will cut."

We are of the opinion that in order to get best results from this operation, the area which has been cut must be sprayed with some chemical weed and brush killer to keep down sprout growth until grass has time to become established. Even then, brush growth will take over roadsides unless it is kept under control for a period of several years.

Cost Information

Of course, the most important feature of any phase of highway maintenance is that of cost. It is relatively easy to arrive at the cost of the operation of this brush cutting unit. We have operated this
(Continued on page 135)



● BRUSH cutter at work. It will handle brush to 3½" size.

but of much heavier construction than the usual highway mower.

The Asplundh chipper is trailer-mounted and consists of a rotating head powered by an International V-2 power unit. This head contains three 9-inch cutting blades. The chipper is towed by a pickup truck and follows closely behind the brush cutter. Brush cut by the cutter is picked up and fed into the chipper by hand. The chips are ejected through a chute at the front of the machine and deposited on the roadside. These chips are about the size of planer shavings, and are not large enough in size or quantity to damage any growth along the roadsides, or in the adjacent fields. In practice, they are spread out over a large area so that they do not form a blanket, in fact, they are said to form a good mulch for desirable growth. If desired, however, a chute is available for depositing this material into the truck towing the unit.

have found that at least three extra men are necessary, and under some conditions, four or five are required if the machines are to be operated at their maximum efficiency.

It may appear that the operation of these machines requires the use of a great deal of hand labor. I once knew a man who cut a lot of brush and left it lying where it was cut. I assure you that he spent considerable time during the following seasons hating himself. Something has to be done with it, and formerly we have loaded it on trucks and hauled it to fires for burning, as we found this to be a little more efficient than burning it in small piles along the roadside. Burning of brush creates a hazard which may be very costly in addition to the labor cost itself. Brush can be picked up by hand labor and fed through the chipper faster and easier—and cheaper—than it can be loaded. Once in the chipper,

WHY SOFTENING SAVES MONEY and MAKES WATER BETTER

DANIEL J. SAUNDERS,

Vice-Pres., The Permutit Company

THERE is no question but that the first duty of a municipality is to provide its citizens with an abundant supply of water which is safe for drinking purposes.

Having accomplished this necessary and worthy achievement, too many municipalities are then content to rest on their laurels. But a water which is satisfactory for drinking is not necessarily satisfactory for all other uses such as bathing, washing clothes and dishes and industrial purposes.

Water may be so hard that bathing or washing anything in it is very unsatisfactory. Hard water not only wastes an enormous amount of soap but it leaves a sticky, insoluble, curdy deposit on everything washed in it. Bathing in hard water can hardly be described as an unalloyed pleasure for this scum deposits on the skin and has to be rubbed off on the towel. Shampooing in it is most unsatisfactory for the hair offers an excellent lodging place for this deposit, dulling the natural color and sheen; and even lemon or vinegar rinses do little to alleviate it.

Clothes, washed in hard water, have a harsh, rough feel, the "tattle-tale gray" appearance; and, on standing in the linen closet, develop a rancid odor. An even more serious effect is that, as these insoluble deposits accumulate in laundered materials, they tend to embrittle the fibers thus shortening their useful life. This is not, by any means, an inconsiderable item of expense. As for soap wastage, this is so large that, on the average, it has been found to cost about three



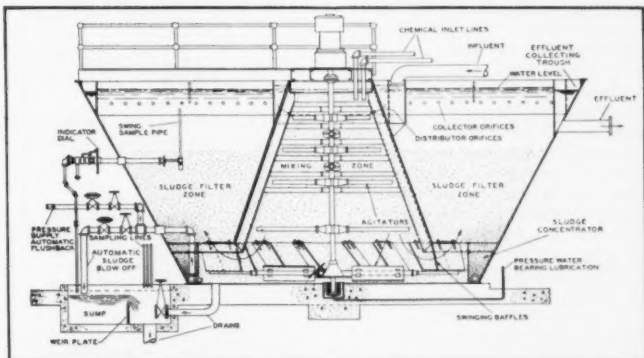
times as much as the cost of the materials used to soften a municipal water supply.

But hard water has many other disadvantages. In the kitchen, it makes poor tea and coffee; toughens peas and beans cooked in it, making them hard and unpalatable; and scales up cooking utensils. This same hard, rock-like scale also forms in water heaters, hot water piping and fixtures. This, in turn, wastes fuel, increasing expenses for repairs and replacements and decreasing the available flow through the hot water system. As an illustration of the decreased flow caused by hard water scale, one-quarter inch thickness of scale in the widely used three-quarter inch pipe, decreases the effective diameter to

one-quarter inch. Since the flow rate is proportional to the squares of the diameters, the flow in such a scaled pipe would be reduced to one-ninth of the original flow.

Municipal Water Softening

The annoyances, difficulties and expenses to the citizens, caused by the use of a hard municipal water supply, can be eliminated by the installation of a municipal water softening plant. Over 650 municipalities situated in hard water areas of the United States are now softening their water supplies thus furnishing their citizens with a water which is not only fine for drinking and fire-fighting but is also excellent for bathing, washing, laundering, shaving, shampooing cooking and all other household purposes. Furthermore, as previously stated, it has been found that the savings to the citizens, effected by softening the water, have been several times the cost of softening. In other words, municipal water softening is not a luxury. Instead it



● CROSS-section of a Precipitator, showing construction details.

is a sound investment which pays handsome dividends to all of its users.

There are two methods of softening a municipal water supply. These are the zeolite process and the cold lime (or lime-soda) process. Both yield excellent results. A survey by a reputable consulting engineer will show which process is best suited to the needs of any specific community.

The Zeolite Process

The zeolite process of water softening is carried out simply by flowing the water to be softened through a bed of a granular material, known as a zeolite or sodium cation exchanger. The process may be carried out under pressure, in which case the zeolite bed is contained in a closed steel shell. Or it may be carried out in a gravity type softener in which, the bed is contained in an open top concrete shell. In either case the principles of operation are the same so the description will be confined to the more widely used pressure type.

The pressure type zeolite water softener consists of a closed steel shell containing a bed of granular zeolite supported by layers of graded gravel lying over an underdrain or strainer system. The water to be softened is admitted under pressure through the upper portion of the shell and uniformly distributed over the surface of the zeolite bed. It then passes downward through the zeolite, during which passage the hardness forming elements—calcium and magnesium—are removed by the base-exchanging action of the zeolite thus softening the water. The softened water then passes through the supporting layers of graded gravel and is collected by the underdrain system, flowing to the outlet and thence to the service line.

When the water softening capacity of the bed is exhausted, the softener unit is regenerated. There are three steps in this regeneration.

The first is backwashing, which is effected by passing a strong current of water upward through the softener. This loosens and regrades the zeolite bed, holds it in a suspended condition, and removes by washing up and out any dirt which may have collected on top of the zeolite bed during the softening run.

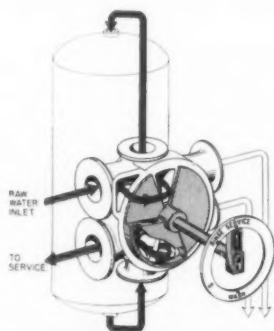
The second step is brining. This is accomplished by introducing into the softener a predetermined amount of a solution of common

salt, by means of a hydraulic ejector, which is an integral part of the softener. This salt solution is uniformly distributed over the top of the zeolite bed and passes downward through it. As it does so, the salt reacts with the zeolite, removing the calcium and magnesium in the form of very soluble chlorides, and, simultaneously, restores the zeolite to its original active or sodium condition.

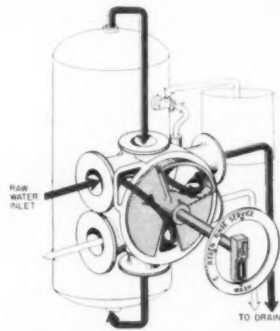
The third and last step is the salt rinse, which consists of washing. The calcium and magnesium and

time the capacity of a unit became exhausted. As the water demand in a municipality can vary from day to day, it often happens that the end of the softening run of a unit occurs at night or at some other time when the operator is absent. With the manually operated water softener, such occurrences may result in hard water getting into the lines with consequent customer complaints.

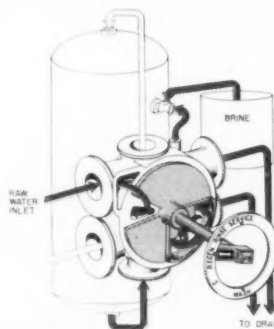
In the automatic zeolite water softener, a motor-driven multiport valve, coupled with electrical



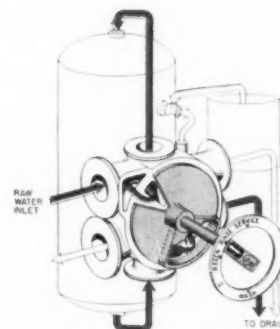
● **SERVICE** position of Permutit multiport control valve.



● **BACKWASH** position, water flows from bottom to top.



● **REGENERATION**, recharging brine passes through the bed.



● **RINSING**, the last step before again starting softening.

chlorides, plus the excess salt, are removed to the drain by means of a brief, fairly slow flow of water. After the salt rinse, the softener is returned to service.

Initially zeolite water softeners were regenerated by hand which meant, of course, that the operator had to be in attendance at whatever

controls, performs all of the operations automatically. Thus at the end of the softening run the softener unit is automatically cut out of service; automatically backwashed; automatically rinsed; and automatically returned to service. Briefly, the way in which it accomplishes these operations is as follows:

An electric contact head meter placed in the soft water line closes a switch when the predetermined amount of water has been delivered and causes the motor to rotate the multiport valve to the "wash" position. After backwashing, which is automatically controlled as to the rate of flow and period, a time switch causes the valve to be turned to the "brine" position, and a predetermined quantity of brine is injected into the top of the softener, passing down through the zeolite. A float valve or brine meter contactor actuates the control valve to turn to the "rinse" position, and a time switch ends this last operation. The motor then rotates the multiport valve to the "soften" position, thus completing the cycle and returning the softening unit to service.

For municipal water softening, zeolite units are usually supplied in batteries so that when one unit is out of service for regeneration, the other units of the battery carry the full load. Therefore, there is no interruption in the service. The zeolite method of water softening is particularly adaptable to well water supplies, many of which contain undesirable hardness.

The Cold Lime (or Lime-Soda) Process

In the cold lime (or lime-soda) process, the water is softened by adding to it substances which react with the hardness in the water to form insoluble precipitates, which are removed by settling and filtration. The removal of bicarbonate hardness is accomplished by the use of measured dosages of lime. With waters containing appreciable amounts of non-carbonate or sulfate hardness, soda ash may be required as well as lime. In addition, a small dosage of a coagulant, usually aluminum sulfate, is required to effect a good settling and consequent filtration.

These chemicals are fed continuously, in proportion to the flow of raw water entering the treating tank or basin, and in dosages according to the composition of the water and the results desired.

With the older type of cold lime soda water softeners, it was necessary to recarbonate the softened water, otherwise so-called "after-deposits" were formed in both the filters and distribution system. In the newer, sludge-blanket type of cold lime-soda water softeners, such as the Permutit Precipitator, such deposits are not formed and conse-

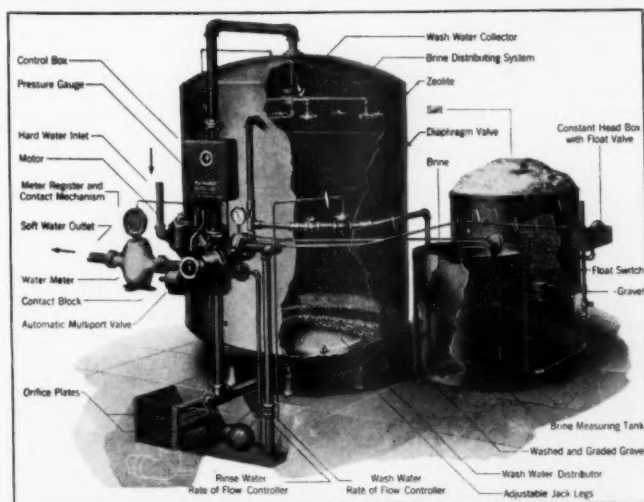
quently these difficulties have been overcome.

In the Permutit Precipitator, the unit is divided into an inner compartment and an outer compartment by means of sloping walls. The hard water and the required chemicals are thoroughly mixed while flowing downwardly through one compartment. On reaching the bottom, the flow is reversed so that the water flows upwardly through the other compartment.

The chemicals react with the hardness, precipitating it as a sludge of insoluble calcium carbo-

removed by filtration through sand or Anthrafil filters, yielding a crystal clear, softened water with filter runs of 60 hours and longer. As new sludge is formed, the excess is intermittently blown off to waste through sludge concentrators at a rate sufficient to keep the height of the blanket within the specified limits. This is done automatically. In addition to its use as a water softener, the Permutit Precipitator is also widely employed for coagulating turbid and colored waters.

Iron is an objectionable constituent of many hard waters. In well



● DETAILS of a zeolite softener are shown in this phantom view.

nate and magnesium hydroxide. As the treated water rises through a blanket of these precipitates, it is filtered and brought into chemical balance by its intimate contact with the particles composing the blanket. Due to the sloping sides of the compartment, the cross-sectional area increases upwardly and therefore the velocity of the treated water constantly decreases as it rises until it reaches a level where it is no longer able to keep the precipitates in suspension. In water softening practice, it is found that there is a sharp demarcation between the upper level of the sludge blanket and the comparatively clear water above it.

The effluent resulting from such treatment should contain less than 10 ppm of turbidity. This is easily

waters it is usually present as ferrous bicarbonate. Waters containing iron are usually clear and colorless when drawn but, on standing in contact with air, cloud, become colored and finally deposit a yellowish or reddish brown precipitate of ferric hydroxide.

Iron Removal

Such iron-bearing waters have many objectionable features. They have an unpleasant, astringent taste; they stain drinking glasses, porcelain fixtures and laundered materials; and they impart a discolored or muddy appearance to coffee or tea made with them.

In softening such waters in the Permutit Precipitator all that it is necessary to do is to aerate the

(Continued on page 110)

MECHANIZATION OF

THE Texas Highway Department policy of securing more and better equipment for our work has now been in force about six years, and the results are proving that increased mechanization is the principal answer to our problems.

The diminishing supply of labor for our work is largely offset by greater utilization of equipment, and the tremendous strides in equipment development during the past few years further justify its maximum use. The other day one of our District Maintenance Engineers stated that, compared to five years ago, he is maintaining almost twice the mileage with ten percent fewer men. And further, he stated that work output per man had increased two hundred percent. In his District, three or four-man work

P. S. BAILEY,
State Maintenance Engineer

ideal for use on small, widely separated jobs. The track-type end loaders can do the work of the pneumatic tired loaders plus heavier excavation, and loading where the footing is soft; but it must be loaded and hauled to the work site. This disadvantage is partly offset by use of a tilt type trailer with tandem wheels, which can be towed by a dump truck.

We now buy motor cranes in the 40,000-pound class, with a 15-ton crane, and a $\frac{3}{4}$ -yard bucket. These machines are used for unloading practically all material in rail shipments, miscellaneous hoisting jobs, and any excavation or loading

where the quantity does not justify moving in a heavier duty machine. Three-quarter yard track-type draglines and power shovels are our heaviest pieces of excavation equipment. The limit is set here by the opinion that work calling for heavier equipment should generally be done by contract, and on the rare occasions when such machines are needed on maintenance or force account work, they may be obtained by lease or rental.

Loading Equipment

Special loaders are being utilized to advantage. In the flat, humid coastal sections, where ditches are seldom dry, a motor crane with an excavating bucket on a telescoping boom can clean ditches to grade from its operating position on the shoulder. In parts of East and West Texas, where sandy soil is predominant, an excavation and conveyor loading attachment for motor graders is cutting the cost of ditch cleaning. On one job one of these machines loaded twenty-one trucks of four cubic yards capacity each in nineteen minutes, or at the rate of 265 cubic yards per hour. However, on usual ditch work, about 500 cubic yards per day is our average. These, and other special purpose machines, are finding their place in the solution of difficult excavating and loading problems.

Proper distribution of loading equipment is an important element in securing its maximum use. Maintenance sections are permanently



● **CLEANING ditches to an accurate grade with a Gradall machine.**
This work is in the coastal area where slopes are very flat.

crews with equipment are now doing jobs on which twelve men were required a few years ago.

Trucks are still the backbone of maintenance equipment. All of our 1½-ton dump and flat bed trucks have been replaced by heavier units, and the entire truck fleet is being expanded as our work increases, with replacement schedules insuring against obsolescence.

End Loader Contributions

If any one type of equipment has contributed most to highway maintenance work, it is probably the end loaders. Pneumatic tired end loaders are excellent for stockpile or windrow loading and light excavation, and their mobility makes them



● **DOMOR attachment cleaned ditches on 39 miles of road in 6 weeks.**

HIGHWAY MAINTENANCE

assigned end loaders which are suitable for normal maintenance loading jobs, such as ditch cleaning, restoring shoulders, sodding, and loading materials for pavement repairs. The motor cranes, power shovels, and drilling rigs are assigned to the Districts and are routed as needed among their eight to twelve Maintenance Sections.

Digging test holes, formerly a slow, hard job, is made much easier and cheaper by use of rotary drilling rigs. Our Amarillo District reports that on recent investigations for base material, their machine dug fifteen holes twenty-four inches in diameter and twenty feet deep in one day. And when drilling through caliche and rock, holes are dug in half the time required by hand methods, when the drill is used in conjunction with a paving breaker and dynamite. If material testing does not keep the machine busy, it is used in tree planting, setting fence posts, and numerous other drilling jobs.

Motor Graders

Purchase of motor graders is being scheduled to match our work. Each District has several 100-hp machines for force account and heavy maintenance work. The Maintenance Sections have 75-hp machines which are adequate for most of their work, and recently a number of the Districts have received some light machines, about 8500 pounds in weight, with 35 hp and with tandem drive. They report these are very satisfactory for spreading asphaltic concrete level-up, blading flexible or soil shoulders, and light ditch work.

Increased mechanization of asphalt surface repairs by using heavier equipment and more special purpose equipment has helped increase work capacities. The loaders discussed previously are a big help in this work. Maintenance Sections are supplied with asphalt booster tanks and with maintenance pots which are insulated. These have 600-gals. capacity, and are equipped with power, pump, and spray bar, adequate for placing tack coat for asphaltic concrete level-up, hand spray work, spot or section seals, and miscellaneous minor penetration asphaltic surface

applications common to normal maintenance work. The old tongue type maintenance rollers could not keep up with the increased work volume and the five to eight-ton flat wheel rollers proved to be too unwieldy for maintenance use, so the Maintenance Sections are now being furnished a two-drum three-ton roller which has retractable wheels and a towing hitch. This roller has only been on the market a few years, but its mobility and work capacity have already proven its value to us.

Heavier Asphalt Equipment

Each District maintains an up-to-date assortment of heavier asphalt equipment for placing seal coats and asphaltic penetration surfaces in force account work. This includes distributors, circulating heaters, spreader boxes, brooms, five to ten-ton flat wheel rollers, and pneumatic rollers; and recently portable asphalt storage tanks have been added to the list. These portable tanks, generally of about 12,000 gallons capacity, are of especial value on jobs that are not suited for rail shipments. Almost every point in Texas is within six or seven hours truck haul from the refineries, and such shipments to a tank which can be easily set up on the job is providing excellent asphalt delivery.

In addition to the major equipment, items of minor equipment are effective time savers. Spray painting is replacing the brush; a thirty-six inch cycle mower is eliminating much of the hand work in weed cutting at markers; pneumatic tamps speed and improve compaction; and numerous pneumatic tools for chipping, sawing, nailing, and other jobs are being used daily. In cleaning concrete pavement joints ahead of the application of sealing compound, a crew of five or six men is replaced by one man with a joint grooving machine. The machine can stay ahead of normal pouring operations; and in addition to removing old joint material, it provides better bonding for the sealing compound by scouring the sides of the joint. Also it can be used to groove out small cracks to permit sealing.

The Districts themselves have developed equipment to meet some of their special needs. In the Yoakum

in TEXAS



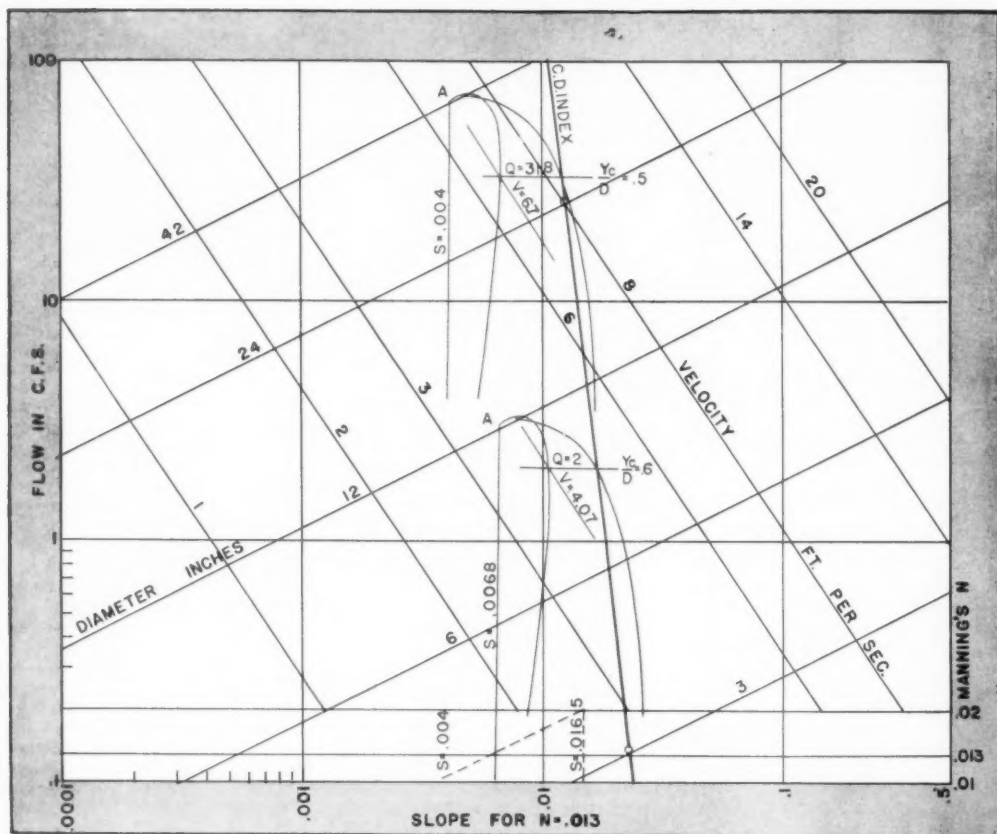
● PREPARING joints and cracks for sealing with Tennant machine.

District, where extensive slurry pumping is performed in undersealing and levelling concrete pavement, pneumatic drilling attachments have been placed on a farm tractor, utilizing maximum mechanical effort in drilling holes for pumping slurry. The El Paso District has developed a spreader for widening the pavement or repairing pavement edges with asphaltic concrete. These examples are typical of the attention being given to find equipment for maintenance work.

In buying new equipment the Equipment Division is procuring highest obtainable quality without eliminating competition. Purchases are made on the low bid basis, but careful preparation of specifications to eliminate products which are not suitable has removed most of the lemons from our equipment inventories. The danger of allowing ourselves to become loaded with "gadgets" is another hazard that is carefully considered, especially in purchase of special purpose and unproved products.

Experience up to now has convinced us that equipment is the one bright spot in trying to stretch maintenance funds over the increasing highway maintenance functions. With continued efforts in mechanizing maintenance work, we believe Texas highways can be properly maintained at an economical cost.

A RAPID METHOD FOR DETERMINING CRITICAL DEPTH RELATIONSHIPS IN PARTLY FULL PIPES



● THIS is Fig. 1. It is a standard network chart on which Fig. 2 can be superimposed as shown in red.

H. J. MILES,
Professor of Civil Engineering
A. and M. College of Texas

IN the hydraulic design of pipes flowing partly full it is often necessary to compute the critical depth and the slope, discharge, and velocity at this depth. Because of the complicated geometry of the circle it is difficult to determine these quantities without the use of

tables and, in some cases, long calculations.

It is possible, however, by means of a simple curve, the $Q - Y_c$ curve of Fig. 2, used in conjunction with a standard network chart, Fig. 1, to solve these problems by direct reading in a much shorter time than by conventional methods. By combining the $Q - Y_c$ curve with the $Q - V$ curve described in a previous article (1) the usefulness of both curves is greatly increased.

The combined curves are drawn

on a rigid transparent material and used as illustrated in the following

Nomenclature

- d = diameter, in.
- D = diameter, ft.
- Q = discharge, cfs
- S = slope, ft. per ft.
- V = velocity, ft. per sec.
- Y = depth of flow, ft.
- Y_c = critical depth, ft.

examples. For convenience in following the examples below, Fig. 2 has been overprinted in red in two positions on Fig. 1.

Illustrative Examples

Example 1.—Problem: Given diameter (d) = 42 ins, slope (S) = 0.004, and n = 0.013. Compute the ratio of critical depth to diameter (Y_c/D) and the values of discharge (Q) and velocity (V) at this depth. **Solution:** (Fig. 1 upper overprinted sketch). Place the index point A of the sliding scales at the intersection of d = 42 ins. and S = 0.004 keeping the vertical lines of the scales and network chart parallel, as shown in red. Where the $Q - Y_c$ curve (right) crosses the critical depth index line on the network chart read Y_c/D = 0.5 and Q = 31.8 cfs, as shown in red. Under the point marked Y/D = 0.5 on the $Q - V$ curve (left) read V = 6.7 ft per sec, also in red.

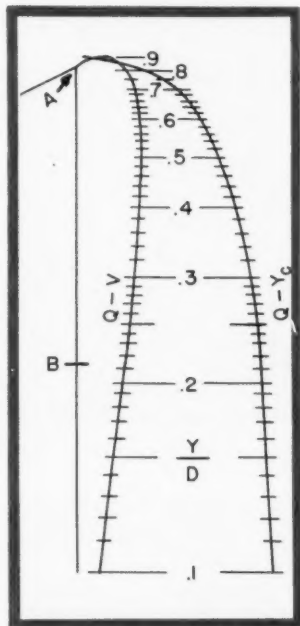
Example 2.—Problem: Given d = 12 ins. and discharge at critical depth 2 cfs. Compute the values of Y_c/D , V , and S when (a) n = 0.013, (b) n = 0.02, and (c) n = 0.01. **Solution (a):** (Fig. 1 lower overprinted sketch). Slide the index point A of the scales along the 12-in. diameter line until the $Q - Y_c$ curve (right) crosses the critical depth index line at Q = 2, as shown in red. Read Y_c/D = 0.6, V = 4.07, and S = 0.0068 as shown. **Solution (b):** With the sliding scales in the same position as in part (a) follow down the vertical line of the scales to the horizontal line of the network chart labeled n = 0.013, then up to the right parallel to the diameter lines as shown in red to the horizontal line marked n = 0.02. Directly below read S = 0.0165. V and Y_c/D are the same as in part (a). **Solution (c):** With the sliding scales in the same position as in part (a) follow down the vertical line of the scales to n = 0.013, then down to the left parallel to the diameter lines as shown in red to n = 0.01. Directly below read S = 0.004. V and Y_c/D are the same as in part (a).

In a similar manner many other types of problems can be solved involving various combinations of d , Q , V , S , n , and Y_c/D . If the $Q - Y_c$ curve is entirely to the left of the critical depth index line the flow will be tranquil for all values of Q ; and, conversely, if it is entirely to the right of the line it will be rapid. In some problems it will be found that the $Q - Y_c$ curve

crosses the index line at two points. This indicates that for a given diameter and slope and n the flow will be rapid for values of Q between these points but tranquil for other values of Q .

Construction of Chart and Curves

Any network chart based on the Manning formula and having the



● FIG. 2 is the $Q - Y_c$ curve which makes possible quick solutions of many problems.

same vertical and horizontal scales can be used. The n scale is added by merely shifting the decimal point of a portion of the Q scale. The critical depth index line is the locus of points where $V = \sqrt{g D}$. For example, when D = 2 ft., V = 8.02 and when D = 0.25 ft., V = 2.84 ft. per sec. These two points on the index line are shown as small red circles on the $C D$ line in Fig. 1.

The sliding curve can be photographed from Fig. 2 on transparent film, care being taken that the distance between points A and B is made equal to the scale modulus of the network chart on which it is to be used. If preferred it can be constructed as follows:

Construct the $Q - V$ curve as explained in a previous article (1) on a piece of tracing paper. Select some convenient value of diameter, such as 1 ft., and compute values of Q for values of Y_c/D ranging from 1 to 0.1. For these computations Table 130 in King's Handbook of Hydraulics (2) will be very useful. Using the discharge scale of the network chart plot these values of Q on the critical depth index line, labeling the points with corresponding values of Y_c/D . Keeping the vertical lines of the $Q - V$ scale and chart parallel, slide the index point A along the 12-in. diameter line. As extended horizontal lines through the Y/D divisions of the $Q - V$ curve cross the corresponding Y_c/D divisions just marked on the index line, mark these said points on the horizontal lines drawn on the material of the sliding scale. The resulting curve connecting these points will be the $Q - Y_c$ curve.

For example, using a pipe diameter of 1 ft., when Y_c/D = 0.6, Q = 2.0 cfs. Mark the point on the critical depth index line where it crosses Q = 2.0. Placing the $Q - V$ curve on the network chart so that the vertical lines of both drawings are parallel, slide the index point A along the 12-in. diameter line until the horizontal line through Y/D = 0.6 on the $Q - V$ curve intersects Q = 2.0 on the index line. (See Fig. 1 lower overprinted sketch). Mark this point Y_c/D = 0.6 on the material of the sliding scale. In a similar manner the remaining points on the $Q - Y_c$ curve are located.

This method can be used for open channels of any geometrical cross-section using any open channel formula. If any formula other than the Manning is used the method of adjusting slope for various values of roughness would of course need to be modified.

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- (2) Handbook of Hydraulics. By H. W. King. McGraw-Hill Book Co., Inc., 1939.

HOW TO TEST FOR FLUORIDES

H. C. HELIGE,
Technical Director, and
J. KUSHNER,
Chief Chemist, Hellige, Inc.

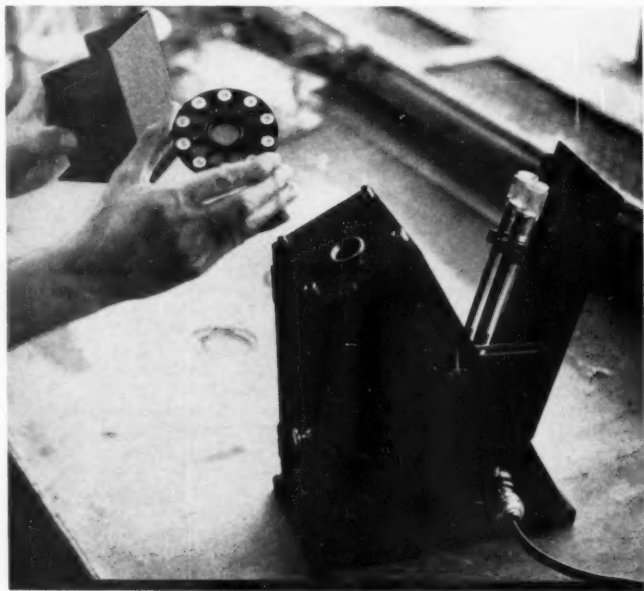
FLUORIDATION has arrived and is here to stay. During the past five years, since the completion of the primary surveys on the effects of fluoridation, there has been a growing nationwide demand for this treatment. The American Dental Association, The American Medical Association, The National Research Council, The U. S. Public Health Service, The American Water Works Association and many other organizations have issued formal statements of policy favorable to fluoridation. Many large American cities, including Washington, Philadelphia, Cleveland and Milwaukee are now fluoridating and well over 200 municipalities are treating or actively planning the addition of fluoride to the public water supplies.

While there is no possible danger of acute fluorine poisoning from waterborne fluorides,¹ it is essential from both a medical and economical viewpoint that accurate concentration control be maintained wherever fluorides are added. Too much may result in harmful dental fluorosis—too little is ineffective and defeats the purpose of the program. Every month of undertreatment deprives individuals of the added tooth protection which fluoride can provide. This protection cannot be regained once the formative years of dental growth have passed. The optimum value of fluoride concentration for a particular locality can only be assured by proper chemical feeding and accurate, continual testing of the treated water.

At present the methods of greatest interest for the determination of fluoride are based on the Sanchis reaction.² In this method the color of a red zirconium-alizarin lake is



● *MAKING a fluoride determination with the Aqua Tester.*



● *HOW to place the fluoride color disc into position.*

reduced in proportion to the quantity of fluoride, which forms a very slightly ionized complex with zirconium. The loss of zirconium to this complex removes the former from its combination with alizarin. The result is a decrease in the red coloration and a simultaneous increase of the yellow color of the alizarin dye which is released from the lake.

The Scott modification^{3,4} of this procedure is the most widely used and is the only method officially accepted by the American Public Health Association and The American Water Works Association.⁵ Although other modifications of the same basic procedure have been proposed and tried, the Sanchis-Scott remains the most accurate, accepted method available today.

Making the Fluoride Test

Two basic methods of using the Sanchis-Scott procedure are available: a) using a series of solution color standards which must be individually prepared each time a test is to be made; and b) using commercial testing apparatus employing standards representing the colors occurring in the test.

The first method is described in "Standard Methods for the Examination of Water and Sewage". Sanchis-Scott fluoride reagent is added simultaneously to the sample under test and to a series of eleven fluoride standard solutions made by carefully weighing and diluting a pure fluoride salt that has been oven-dried for two hours. At the end of a one-hour waiting period the treated unknown solution is placed in a Nessler tube and compared visually to the series of simultaneously prepared standard solutions also contained in Nessler tubes. Each time a test is made another complete series of standard solutions must be prepared. In the presence of certain interfering substances commonly found in water, this method requires that the sample be pre-treated and distilled under closely controlled conditions before a fluoride determination can be made. Unfortunately this method requires a trained, experienced chemist, a well equipped laboratory, and a tremendous expenditure of time. The continual preparation of solution color standards makes it unsuited to the busy laboratory of a modern water treatment plant.

For plant control, commercial apparatus is available that gives excellent results. The method of per-

forming the test with such apparatus eliminates tedious continual preparation of standard color solutions and the apparatus can be used by water plant operators who do not have special training. Interfering substances present in the water sample have no more effect when such apparatus is used than when the test is performed with individually prepared solution color standards. A unique feature of commercial testers, not feasible with the method using individually prepared standards, makes possible the determination of fluoride in naturally colored or turbid waters without the necessity of pretreatment or distillation. A tube containing untreated water is placed behind the commercial color standards when the comparison is made. This automatically cancels the effect of color and turbidity in the sample so that only the color chemically developed in the test is compared to the standards.

Using Commercial Equipment

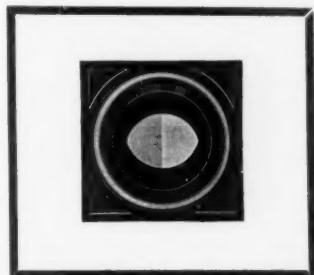
An example of commercial equipment that has been tested and proven on a nationwide basis is the Hellige Aqua Tester and Fluoride Color Disc. In performing a fluoride determination with this apparatus, a sample of water is measured directly in a 50-ml glass-stoppered cylinder and 2.5 ml of fluoride reagent is added. The use of the cylinder instead of other containers reduces the number of vessels and manipulations required in obtaining a measured sample and it decreases the chance of accidental contamination. The glass stopper simplifies mixing the reagent and sample.

The Hellige fluoride reagent has exactly the same chemical composition and is used in the same ratio to test sample as the Sanchis-Scott reagent required in the "Standard Methods" procedure. The standard reagent deteriorates during storage, but the Hellige fluoride reagent is available in three much more stable standardized component solutions, so that a small amount of Sanchis-Scott reagent can easily be freshly mixed as required. This assures Aqua Tester users of a fresh supply of reagent at all times, and makes tedious weighing unnecessary. Because the color developed in the fluoride test is strongly affected by the purity of the raw chemicals used in making the Sanchis-Scott reagent, the component solutions are prepared with carefully purified and standardized chemicals so that uni-

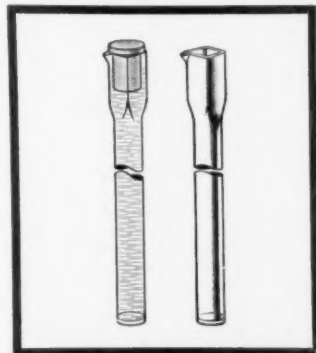
formly accurate results are always assured. Ready-to-use fluoride reagent, if kept refrigerated and protected from light, may remain usable for four or five weeks. If refrigeration is not available, fresh reagent should be prepared each week from the three stable components.

How To Take Samples

Sampling of fluoridated water should always be done at a location sufficiently remote from the point of fluoride application to insure that the water and fluoride are well mixed and that the sample is truly representative. Fluoride is quite stable in water and there will be no significant losses in transit or storage of samples. Therefore, as portability is not an important factor, the Aqua Tester can be kept and used in the most desirable location. The test should be conducted where accidental contamination by airborne fluoride dust from the feeder or storage bins will not occur. Bottles used for sampling must



● ACTUAL size of color comparison fields, shown side by side.



● HELIGE Nessler tube, right; tube with glass plunger at left.

be absolutely clean and dry. They should not contain thiosulphate or any other preservatives commonly placed in sampling bottles for other tests.

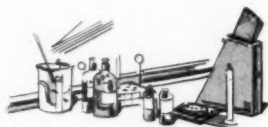
The sample mixed with reagent in the glass-stoppered cylinder is allowed to stand for one hour. During this time the temperature should be maintained between 23 and 27°C for uniform color development. This is easily done by placing the cylinder in a 1000 or 2000 ml beaker filled to the neck of the stoppered cylinder with a mixture of hot and cold tap water. One adjustment at the beginning of the test will usually suffice for the full hour waiting period because of the large size of the beaker and the small difference between room temperature and the desired range. At the end of one hour, the sample is transferred to a Hellige Nessler tube. A polished glass plunger, furnished with the tube, is inserted to adjust automatically the viewing depth to exactly 200 mm. Excess liquid fills the space around the plunger, making it unnecessary for this tube to be filled to any exact level. The plunger also eliminates annoying reflections and lens effects caused by the meniscus occurring in ordinary Nessler tubes.

Long tubes of 200 mm viewing depth are required in the fluoride test because the colors developed are very faint and because the discrimination between adjacent values is very small. The tube (together with another containing an untreated sample to compensate for original sample color or turbidity) is placed in the Aqua Tester and the determination made by revolving the color disc, bringing one standard after another into view for comparison. A prism attachment with magnifying lens brings the color of the standard and test sample side by side without any visible dividing line to further facilitate color comparison.

More About the Tester

The Hellige Fluoride Color Disc No. 611-75 contains ten permanent glass color standards representing the values 0, 0.1, 0.2, 0.4, 0.6, 0.8, 1.0, 1.2, 1.4 and 1.6 ppm fluoride. Higher values, such as those found in fluoride feeding solutions, can easily be determined with the same color disc by diluting the sample and multiplying the result obtained by the dilution factor. The standards, made of solid color glass, cannot fade with time or burst from freezing during shipment or stor-

age in cold climates. The colors developed by the reagent are pale red at the lower concentrations of fluoride, changing to pale yellow in the upper part of the range. The natural color differences are very small and this makes color comparison of individually prepared solution standards difficult. The Hellige color disc, on the other hand, overcomes this difficulty by use of a unique optical principle. A light blue glass filter is mounted in the center of the color disc to modify the color of the treated sample. The actual colors compared are al-



tered by this filter to lavender at the lower concentrations, brown in the middle of the range, and green at the higher concentrations. The color difference between adjacent standards is thus greatly increased and consequently permits much more accurate comparisons to be made, especially by untrained personnel. The Aqua Tester, which is constructed of steel with a cast iron base, has its own built-in source of illumination. This makes color matching completely independent of time and weather, an important factor in accurate fluoridation control. Because the chemical color development itself requires one hour, it is important that no further delays prevent the immediate testing of samples taken at night.

Interference

Some of the substances present in domestic water supplies and many of the chemicals added during water treatment interfere with the test for fluoride. Fortunately considerable work has been done recently on simplified methods for removing interferences and, in fluoridation control, it is now possible to eliminate or to estimate the effect of most substances without resorting to the difficult and cumbersome distillation procedure. In general the interfering substances fall into two classes—those which cause an apparent increase in fluoride content and those which cause an apparent decrease. The following are interfering substances found in water supplies:

Chlorine is the most common interference because it is so frequently added to domestic water. As little

as 0.1 ppm will cause an appreciable apparent increase in the fluoride content. The addition of a slight excess of 0.5% sodium arsenite will remove the chlorine without affecting the test. It has been found that as much as 25 mg of sodium arsenite (5 ml of a 0.5% solution) in a 50-ml sample will cause no interference whether chlorine is present or not, provided the Sanchis-Scott reagent is used. Some workers have reported difficulty when other modifications of the Sanchis reagent are employed. Of course, 25 mg of sodium arsenite, which will neutralize roughly 270 ppm chlorine in the sample, is an excessive amount; usually only a few drops are required. The arsenite reagent used in the ortho-tolidine arsenite (OTA) test is excellent for this purpose.

Aluminum, another substance frequently introduced during water treatment, will cause an apparent decrease in fluoride values. Every 1.0 ppm aluminum present in the water will lower the fluoride reading by 0.1 ppm fluoride and this factor may be used to give approximate corrections. Occasionally the aluminum can be removed by alkalinizing slightly, settling, and filtering.

Phosphates, particularly metaphosphates (such as Calgon) are sometimes used to treat waters. Every 0.3 ppm metaphosphate will give an apparent increase of about 0.05 ppm fluoride and this correction factor is adequate for plant control. The effect of orthophosphates is only about one tenth as great. The distillation procedure must be employed when the use of a correction factor is not desired.

Iron will cause an apparent increase of about 0.05 ppm fluoride for every 1.0 ppm iron. Aeration of a slightly alkaline sample followed by settling and filtration will frequently remove sufficient iron to permit a direct test.

Manganese, although less frequently found, will cause an apparent increase of about 0.05 ppm fluoride for every 0.2 ppm manganese. Chemical removal is difficult, and if the correction factor is not desirable, distillation must be employed.

Sulfate must be present in amounts in excess of 200 ppm before interference is noted because the high concentration of sulfuric acid in the Sanchis-Scott fluoride reagent represses the effect of this substance. Over 200 ppm sulfate, each 100 ppm causes an apparent
(Continued on page 118)

REPORTS FROM THE FIELD

Better Methods and Equipment for Water Works Construction

WITHOUT A DOUBT, the honor for most effective equipment goes to our team of Oliver-Ware trencher and Hough Payloader. These two pieces of equipment, with a 4-man crew, have laid as much as 500 ft. of 10-inch Transite pipe to a depth of 5 ft. in an 8-hour day. The Payloader kept the trench backfilled up to one exposed length of pipe; and kept the road leveled for traffic up to the exposed pipe at all times. To us, this was wonderful performance.—L. G. Smith, Superintendent, Kennebunk, Maine.

ON THE replacement of a 6-inch broken valve on a fire hydrant stem we used a Goodman stopper (Pollard & Co.). The fire hydrant stem was fed from a 16-inch main. We knew one of the valves controlling this area would not close entirely, so we opened a hydrant a block from our trouble spot. After the broken valve was burnt off, we started our pumps and when the water was down to half-flow in the hydrant stem, we inserted the stopper and inflated it to 15 pounds.



● **PIPE** pusher by Greenlee makes for easy going in water works extensions at Alta Vista, Virginia.

This gave us a dry pipe to work with. When the valve was set, we deflated the stopper and pulled it out through the valve. We got a rush of water, but closed the valve and that was it. This operation saved us from pumping a lot of water.—Walter Molis, Sup't. of Water, Muscatine, Iowa.

A **WARE HYDRO**-trencher on an Oliver "88" tractor was purchased last year. It was used for emergency excavation jobs, and for trenching for 12-inch and smaller pipe, as well as for unloading pipe, handling pipe into trench and laying. For such work it has proven to be a most important piece of equipment.—G. C. Ahrens, Superintendent, Ottumwa, Ia.

AN A-FRAME mounted on a truck is used in laying water mains. We use it to lower large pipe, fittings and valve assemblies into the trench. We also use an A-frame to unload pipe from freight cars and a Minneapolis-Moline Hi-Loader to take pipe from trucks and place it in the storage yard.—R. L. Chandler, City Engineer, Newton, Kans.

A **FORD METER** tester is being used to test and repair our 815 water meters. Every meter will be tested, repaired and replaced in service. This project already has increased our water sales by \$450 per month, and we are now about 85% completed.—Royce K. Waters, Superintendent-Engineer, Winnsboro, La.

IN 1916, the Anson Water District and the Madison Water District joined to put in a 16-inch wood stave pipe line. We have been renewing this line and on about 3 miles of it through rough terrain and swamps we have been using 16-inch Universal pipe. In handling this pipe out of the cars and in the woods, we use a Ford dump truck with a boom built on the front and guyed back over posts. We have



● **LINCOLN** Park, Mich.: E. H. Pate, City Eng'r. (left), L. M. Bailey, Water Sup't. (right), Mayor S. A. Creutz (center) as \$285,000 project was tied into Detroit supply.

a winch to lift and lower the pipe and we can lift and lower the boom by lifting and lowering the truck body.—Wm. G. Hartwell, Sup't. & Treas., Anson, Maine.

WE HAD ONE job of laying 3,000 ft. of 12-inch cast iron pipe in 16-ft. lengths. In placing this pipe on the location and in lowering it into place in the trench, we used a Dodge power wagon with an A-frame in front, connected to a winch. This truck has large tires and is 4-wheel drive. It surely proved its worth on this job.—L. K. Parker, Superintendent, Auburn, Maine.

NORMALLY WE use a backhoe and a bulldozer for excavation and backfill of main trenches; and a bucket loader on a small tractor for filling trucks and cleaning up the job. We also used a combination of oxygen and electric arc for melting lead joints quickly on a job involving the relocation of 700 ft.

of 24-inch cast iron pipe within a space of 30 hours. The joint was melted and the pipe removed in about 10 minutes per length of pipe. —Sidney S. Anthony, Sup't. & Engineer, Augusta, Maine.

ONE OF THE most valued pieces of equipment we have is a Koehring 205 backhoe. With this, we have a 35-ft. boom with a $\frac{3}{4}$ -yd. clamshell. We use this Koehring to unload pipe, dig sewer ditches and make excavations for any purpose. A Barber-Greene trencher is used for water line ditching. —Neal B. Thayer, Manager, Jonesboro, Ark.

WHILE WE have developed no special equipment applications, we use a front-mounted A-frame on a 4-wheel drive truck for pipe laying; and a Huber maintainer for clearing rights-of-way and for backfilling. In addition, we contract some of our work. —Angus E. McVicar, Water Superintendent, Torrance, Calif.

WE PAID for our new sand-blasting equipment in less than 2 months use, utilizing it for sand-blasting old traffic lines from the streets. While this does not pertain to water works, it still saved us money. —K. R. Warren, Chief Accountant, Whittier, Calif.

A LE-ROI TRACTAIR, which powers a Badger hydraulic operated digger was purchased and makes an excellent single-package unit for water and sewer line repairs. In this combined unit, we have an air-operated paving breaker for starting excavation, the digger for making the excavation, a backfill blade on the Tractair for backfilling, and an air tamper for compaction of backfill. —L. R. Kuiper, City Manager, Delta, Colo.

WE NOW USE a 2-inch centrifugal pump with 100 ft. of $\frac{1}{2}$ -inch hose and a $\frac{1}{2}$ -inch nozzle to wash the walls of the settling basins, filters and clear wells. Previously this was done with a garden hose and 15 pounds pressure. I save 15 hours of time and 4 men per cleaning and this is a lot because we clean these units 3 or 4 times a year. —John A. Dionici, Clerk and Commissioner, Louisville, Colo.

A BARBER-GREENE trencher is used for all water line and sewer trenching. Pipe laying is done with

a home-made crane. A LeRoi compressor furnishes air for pavement breaking and similar work. Two Construction Machinery pumps are used for dewatering in case of leak-repair. —Maynard Graham, Water Superintendent, Loveland, Colo.

IN ALMOST CONSTANT use we have: A $\frac{1}{2}$ -yd. shovel and drag-line; a $\frac{3}{4}$ -yd. backhoe; a tractor loader; a D6 bulldozer; a Whirley crane on a 6 x 6 truck; two dump trucks; two 2-ton flat bed trucks; six pick-up trucks; and two 110-ft. air compressors. We lay all water mains, excavate for reservoirs, etc. —W. J. Moore, Sup't. Water Operations, Eugene, Ore.

A 20-INCH well was completed this past year by Ohio Drilling Co. of Massillon. The screen is 16½ ins.,



● **CARBON arc welding "Everdur" bronze screen for a new well at Hamilton, Ohio.**

type H Everdur bronze, slotted and set at a depth of 168 on hard clay. The well produced 1,950 gpm with a 10-ft. drawdown. —H. W. Augenstein, Sup't. Water Works, Hamilton, Ohio.

TAPPING OF ORIGINAL pipe line laid into Westfield in 1874 was our most interesting job. This was 14-inch cast iron pipe. Its condition after 77 years of use was found to be excellent, with very few tubercles in evidence, and the outside of the pipe in perfect condition. —Harry H. Angell, Deputy Sup't., Westfield, Mass.

FOR USE in connection with our calcining plant, we designed and built a shaking screen to remove lumps of iron and magnesium from our home made lime. We are looking for some suitable laboratory equipment for determining fluoride content. —H. V. Pederson, Sup't. and Gen. Manager, Marshalltown, Iowa.

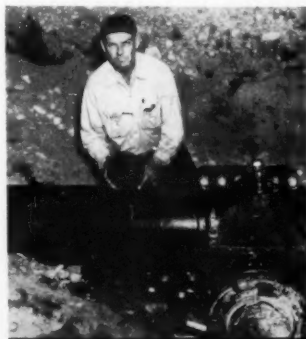


● **ON-THE-JOB view of cast iron pipe laying in Tyler, Texas.**

MORE THAN 30,000 ft. of cast iron water main have been added to our system during the past 12 months. Sizes range from 12-inch to 24-inch. All ditch was dug and pipe laid with a backhoe. —C. P. Stewart, Sup't., Water & Sewer Dep't., Tyler, Texas.

CORROSIVITY OF the soil was studied, for the first time, in conjunction with the failure of a steel feeder main. This survey was conducted by the Cincinnati Gas & Electric Co. through the use of what they term the Columbia rod, which is similar to the Dennison rod. This procedure permitted us to isolate a 700-ft. section of the feeder line and eliminates a source of constant trouble. —William H. Shawhan, Director of Public Utilities, Middletown, Ohio.

TWO-WAY RADIOS in three of our trucks were most effective during a thaw following a severe freeze in Feb., 1951. Since purchasing the water system two years ago, we have purchased two ditchers, an air compressor, several trucks and many other items. We install all mains up to and including 12-inch and in this work our equipment



● **WESTFIELD, Mass., finds pipe laid in 1874 in fine shape.**



for

Cincinnati, Ohio

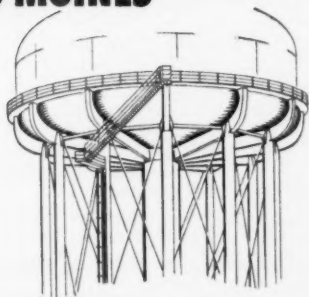
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- ★ Also separate Monotype Die Heads available, $\frac{1}{8}$ " to 2", bolt die heads, $\frac{1}{4}$ " to 2".
- ★ All tools in the "500" thread, cut, ream independently, and right up to chuck, swing out of way when not in use.
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PUBLIC WORKS for April, 1952

has been most useful.—J. E. Williams, Water Sup't., San Angelo, Texas.

IN SALVAGING cast iron pipe, we used an acetylene torch to melt the lead from the joints and a winch truck to lift the pipe above ground level to make the melting easier. The line was just under the grade line for a new concrete pavement.—E. J. Hood, Sup't., Water & Sewers, West University Place, Texas.

RADIO COMMUNICATIONS and plenty of trucks are essential in our operations; and pipe locators and leak finders are necessary all of the time. Without the radio and the pipe-finders, work would be slowed and costs would go up. Self-priming trench pumps and portable light plants are very useful, and the latter is a special labor-saver because it can operate drills, tapping machines, fans, etc. Portable welders are also used to advantage.—J. Guy Eernisse, Ass't. Chief Engr., Tacoma, Wash.

A TRUCK-MOUNTED crane is used for unloading water main from cars. It can handle two 18-ft. lengths of 4-inch or 6-inch pipe at one time. By having two chains with hooks, we can use it effectively for lowering pipe into the trench.—K. L. Mayer, Sup't. Water Dept., Monroe, Wisc.

SERVICE TAPS are made before permanent buildings are constructed and it is often hard to get measurements on curb boxes after the building and landscaping are completed, as references are often destroyed. We have used the "dipping needle" very effectively in locating such curb boxes. We get the measurements from our log book and with the aid of the needle we save many hours of labor.—J. Paul Hardesty, Sup't. Water Department, St. Clairsville, Ohio.

MAIN EXTENSIONS totalling about 20,000 ft. of 4 to 12-inch cast iron pipe were laid. We purchased a D4 Caterpillar tractor with a dozer blade and 18-inch turn-table crane. This machine was used to unload pipe from cars, lay pipe in the trench, backfill and compact. All trench was dug with a Ware backhoe mounted on an Oliver tractor, with complete hydraulic controls.—L. B. Goble, Sup't., North Platte, Nebr.

(More on page 102)

Sidewalk Dangers

Can be Eliminated by RESURFACING

ROBERT L. MEYER,

Vice President, United Laboratories, Inc.

It is obvious that deteriorating city sidewalks do not improve by themselves as each year rolls by. Like everything else subjected to "weather and wear", deterioration continues and costly replacement generally results. Recent years have seen a vast increase in salvaging and renewing sidewalks by resurfacing methods using cold applied asphalt-concrete materials, (commonly referred to as a bituminous "mastic"). Correctly applied and using properly selected aggregates and proportioned materials, this



● AFTER three years of service, no wear is noticeable.



● PLASTIC covering applied to old sidewalk, showing mat effect.

method can give many years of good service. During the past ten years, improved techniques or "know-how" in application along with better materials have been largely responsible for the greatly improved acceptance of resurfacing methods.

The basic method referred to in this article is somewhat similar to the familiar practice of resurfacing highways and streets. This latter procedure has proven highly satis-

factory; and it has been established that sidewalks may likewise be successfully renewed. The materials involved in such renewal include a processed asphalt different than that used in street surfacing. The sidewalk surfacing mixture is a fibrated emulsified asphaltic paste combined with properly graded aggregates and a setting powder or hardening agent. These ingredients are mixed on the job with water and applied by trowel over an asphalt primer

or bond to an average depth ranging from $\frac{1}{4}$ inch to $\frac{1}{2}$ inch, depending upon the requirements of the job. After a 36-48 hour dry, the finished surface is ready for traffic. Its color varies from gray to dark gray; and it gives a resilient surface that is non-skid and non-glaring. The greater the traffic, the more the material compacts and the harder it becomes. It is extremely simple to patch should the surface become damaged for any reason. Because of the hardening agent, the material will not soften under sun or heat up to 140° F. Adhesion to the old spalled surface is exceptionally good and the expansion and contraction of the base will not break this bond.

General Application Process

No chipping or removal of the old sidewalk is necessary. The area to be resurfaced is usually blocked off in sections, allowing passage for pedestrians while work is in progress. The surface is first thoroughly cleaned, removing broken or loose particles of the old surface. Deep holes or uneven sections are filled prior to the resurfacing with a special asphalt grout. All grouted areas are completed at least twenty four hours ahead of the resurfacing to allow these filled areas to dry.

A bonding material is then brushed over the prepared surface and allowed to "set" for approximately one hour prior to applying the hard plastic surfacing. Depth strips are used where necessary in order to assure an even, level surface. The new surfacing is applied to an average depth of one-fourth to one-half inch. Edges of the surfacing at the curb are feathered in order to make the walkway even with the curbing.

The material is leveled at the depth prescribed by specifications. Application is immediately followed by a light troweling (using a wood float). A "finish" steel troweling is given the material after it has taken its initial set. During the progress of this application it is very simple to pitch any low spots for proper drainage and to bring

tion to the process is used involving the use of jute webbing. This method prevents the seepage of moisture into usable areas beneath the walk. This problem, a serious one with many buildings throughout the country, can be overcome if thoroughly and properly dealt with.

After allowing approximately thirty-six to forty-eight hours for the new surface to dry to sufficient hardness, the newly surfaced sections may be opened to traffic. In describing the finished surface, it is interesting to note that the constant flow of foot traffic acts to make the topping more smooth and compact, yet the surface never becomes slippery, either wet or dry. Because of the resilient type of material used, the sidewalks are restful to the feet and the single mat effect improves their appearance.

finely crushed rock can not be recommended. There is available a "packaged unit" that contains all materials, including aggregate, that are factory proportioned so that no formulating on the job is necessary. The contents of this unit are merely mixed with a specified amount of water. The packaged units are available in various gradings of aggregate for applications requiring an average depth of either one-quarter or one-half inch. Each unit is also designed to cover a predetermined area. Through the use of such properly selected materials, much guesswork and chance of error is eliminated.

Many cities whose codes have heretofore specified concrete have amended them to permit the use of this type material. Proper asphalt-concrete or "mastic" mixes have brought about an economical and lasting process of resurfacing and patching that can be used in every section of the country. The methods herein described will alleviate many sidewalk problems, by providing means for resurfacing and renewal, instead of replacement, of deteriorated and dangerous sections.



● **APPLYING plastic covering to the worn section of a sidewalk. Little equipment is required and work can be done quickly.**

any uneven spots to a uniform, smooth surface.

In a few cases, it may be necessary to exceed slightly the one-half inch maximum depth. This is not objectionable and an uneven surface will not develop as a result. The finished appearance of the sidewalks is that of a large mat; no section dividers are needed and concrete expansion joints are completely covered.

It is possible that the surface may form hair-line cracks due to rapid drying conditions. This is not harmful in any way, and such cracks, should they appear, will close as the base expands during warm weather and the walk is subjected to foot traffic.

In sections where waterproofing becomes necessary, a special addi-

tion to the process is used involving the use of jute webbing. This method prevents the seepage of moisture into usable areas beneath the walk. This problem, a serious one with many buildings throughout the country, can be overcome if thoroughly and properly dealt with.

Materials Are Important Factor

Not only is the application important, but so is the selection of materials which can add much to the life of the job. Choice in grading and type of aggregate is especially important. Most suitable aggregates are not always available locally and the use of some types of

Water Works, Sewerage and Natural Gas

H. M. CRANE,

City Manager, La Grange, Ga.

Water works improvements recently completed by LaGrange include a 5 mgd filter plant and pumping station, a new 20-inch feed line from the station to the city limits, and a considerable extension of the distribution system. The total cost for this work amounted to \$1,600,000. Sewerage improvements include a practical doubling of the sewer system to serve more than 90% of the population and a new treatment plant, all of these costing about \$1,500,000. The old propane gas system is being replaced with natural gas and this work will be completed by mid-summer of 1952. Seven new school buildings are under construction or will be built within the next two years. General Obligation bonds to the extent of \$1,450,000 were sold for the school construction—but between the time of issuing the bonds and the letting of the contracts for the schools costs had so increased that the original issue covered only one-half of their cost.

WHOLESALE'S PRODUCTS



Every wholesaler obviously endeavors to carry in stock the kind of merchandise his trade requires and demands. Under normal conditions he can come pretty close to supplying the products his customers ask for; he has the opportunity of selecting from many sources the products which he believes his customers would find most acceptable.

His function and opportunity are no different today—only much more complex. The task of finding merchandise in sufficient quantities, and of the right quality to satisfy his trade, is quite perplexing to him at times.

The good wholesaler knows his responsibilities and strives to maintain his standards at the same level that has built his reputation. You know him by the products he handles and the service he renders under any conditions.

The good wholesaler is conscientious. He can still be discriminating in the choice of brands he stocks for you, for he keeps his eye on tomorrow as well as today and never loses sight of his purpose to render customer satisfaction at all times.

The products he handles reflect the kind of wholesaler he is—a reputable wholesaler handles only reputable merchandise—representing well-advertised brands of dependable quality. In tubing, Wolverine is recognized as a top quality product that you should try to get whenever it is available.

WOLVERINE TUBE DIVISION, Calumet and Hecla Consolidated Copper Company, Incorporated, Manufacturers of seamless, nonferrous tubing, 1451 Central Avenue, Detroit 9, Mich. Plants in Detroit, Mich. and Decatur, Ala.

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Reports from the Field

(Continued from page 98)

A 1½-TON GMC truck chassis was purchased locally and we had a utility body built by James Kiley Co. of Somerville, Mass. We now have a small but complete stock room on the job and we consider it the best \$1775 investment we have made in a long time.—George W. Wood, Superintendent, Amesbury, Mass.

A SEISMOGRAPHIC survey was made for us by the Weston (Mass.) Observatory for the purpose of determining exactly the depth to bed rock in locations for proposed well fields. The resultant graphs present positive profile depths and therefore eliminate unnecessary test drilling. Resultant velocities indicate soil character above bed-rock, and combined with a geological study of the area, a cost-saving analysis of the proposed work can be obtained. We were able to pinpoint our drill work in a selected area, with good results.—Thomas F. Culliney, Sup't., Water Department, Cohasset, Mass.

TWO-WAY RADIO equipment has been installed on our one-ton Water Department maintenance trucks. We find that radio communication is very valuable on both ordinary maintenance and emergency repairs.—J. A. Fish, Director of Water Dep't., Niagara Falls, N. Y.

FOR LAYING WATER mains and sewers, we use: A ¾-yd. Bay City power shovel with backhoe; a 1-yd. Hough Payloader for backfilling under normal conditions; for soft ground an Allis-Chalmers HD-10, with bulldozer; for breaking pavements, an 85-cfm Ingersoll-Rand compressor with jackhammer; for large taps on water mains, a Mueller CC tapping machine; and for service taps, a Mueller B.—Louis E. Zellwager, Sup't., Bureau of Water, Rome, N. Y.

OUR NEW PAYNE-Dean truck-mounted valve operator has saved lots of time. Before we had it, our men had to walk around and around until they were dizzy, taking anywhere from 15 to 30 minutes closing and opening valves. Now we do it easily and much more quickly.—Oscar Schulte, Sup't. of Water, Tonawanda, N. Y.



Many American cities, such as Philadelphia, Boston, Newark, Richmond, Providence, New Orleans, and El Paso have already installed or purchased Federal air raid warning systems and are instructing their citizens in its meaning. Others who see the logic of Civil Defense may not realize the urgency of completing their local plans. Nevertheless, it is a fact that all the billions spent for defense will be of no value if the civilian population, the key to production, is not warned in time for survival.

Expenditures for jet interceptors are spent gladly. Do you realize that for a fraction of the cost of one such fighter, your community can be protected with complete and adequate air raid warning equipment?

It is not only logical, but it is as urgent as defense armaments themselves! You can do something about it. But don't waste your time looking for the loudest and most powerful signal. One large signal cannot completely blanket an area regardless of its output. It is only by a combination of powerful signals like the Federal Thunderbolt and the satisfactory distribution of smaller sirens that complete blanket coverage can be achieved.

A thorough and even blanket distribution of sound is more important than excessive intensity at any one point. Only by the strategic location of 2 HP and larger sirens can a completely successful system be attained. Federal fractional horsepower sirens up through the 2, 5 and $7\frac{1}{2}$ HP models to the Thunderbolt are most economical in first cost, require no maintenance and produce maximum sound per horsepower. Such signals afford the greatest reliability, respond most dependably to centralized control and can be installed with a minimum of material and labor.

Write for our air raid
bulletin today.



THUNDERBOLT



NO. 2

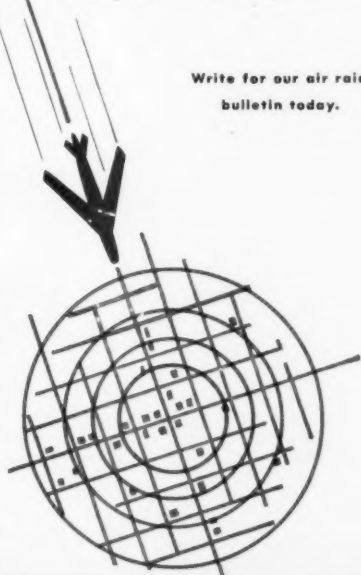


MODEL 7

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EQUIPMENT includes a Parsons 250 Trenchliner, a 406 Buckeye trencher, a 357 Unit Crane, an Oliver front-end loader and an Owen-Holmes loader on a dump truck. We use all of these on water main installation, as well as on other work. We have a gasoline powered soil auger for installing water services.—H. B. Huntley, Sup't., Water & Steam Distr., Lansing, Mich.

ABOUT A YEAR and a half ago we purchased a Minneapolis-Moline tractor with a Henry backhoe attachment. This has proved most successful in our small city. In ordinary digging in sandy soil, two men and the tractor and operator can dig trench, lay 4 or 6-inch pipe, and cover the trench at an average rate of 300 ft. per 8-hour day.—Russell Carlson, City Engineer, St. Louis, Mich.

WE THAWED about 750 ft. of 6-inch cast iron main that had been frozen for two days. We used a No. 71 Engesser gasoline powered thawing machine. It took us 12 hours to do the job, mostly because of long lead wires that were too small. We feel certain that if we



● WELL at Canton, O., see page 95, being test-pumped at 1950 GPM with 10-ft. drawdown.

could have had 300 ft. of large copper wire, the job would have taken only half as long. Our meters showed only 5 volts and about 100 amperes. Frost penetration in the sand and yellow clay soil of this area has several times reached a depth of 8 ft.—Herbert S. Grove, General Mgr., Bd. of Water Comms., Stillwater, Minn.

FOR LAYING water lines we used a Longhorn ditching machine and a Greenlee hydraulic pipe

PUBLIC WORKS for April, 1952

pusher. We also used our ditcher for laying sewer lines. The trench it makes is too narrow to lay 6-inch pipe conveniently, but it serves as base excavation and cuts costs materially.—James Mattox, Mgr., Water & Light Dep't., Columbus Miss.

THREE PORTABLE pumps and a generator, all Homelite, have been most useful in pumping out trenches and in providing light for night work. We are improving chlorination facilities and may fluoridate. Wallace & Tiernan are installing 9 new chlorinators; other improvements include five Venturi tubes, 16 to 30-inch; and 10 Omega gravimetric feeders, five for fluoride and five for lime, will be installed this spring.—Arthur Ambuhl, Superintendent, Troy, N. Y.

HORIZONTAL EARTH boring tools helped in constructing water and sewer services without cutting into pavements. We used a Ka-Mo with a 10-inch horizontal drill powered by an air motor, operating at 70 psi off a 105-ft. compressor.—W. A. Adkins, Sup't. Water & Sewer Dep't., Burlington, N. C.

A LORAIN gasoline shovel is used to dig trenches, take sand from a creek bed to use on roads, and to unload stone from railroad cars. This is mounted on rubber tires. Our Hough loader is used for loading dirt, stone and sand.—Archie B. Uzzle, Jr., Director of Public Works, Hickory, N. C.

WE DESIGNED and built a power driven frost drill to make test holes for locating leaks in water mains under winter conditions. It is a rotary drill, powered by an air motor and equipped with hydraulic controls.—H. T. Hintgen, Sup't., Water Department, Wahpeton, N. D.

OUR MOST effective equipment is a Badger trencher, which we use for cutting sewer and water trench. It is mounted on rubber. It cuts to 24 ins. wide and 10 ft. deep. We put in about 5,000 ft. of sewers and 2,000 ft. of water main last year with this machine. It has also been used by 8 other nearby cities in the four years we have owned it. It can be moved from job to job quickly under its own power.—Chester McFeron, Utility Sup't., Nashville, Ill.

WE CHANGED from a combined dosage of lime and soda ash in our

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In the western Kansas city of Colby, Fairbanks-Morse Dual Fuel Engine economy has been making savings in fuel and lube oil that amount to over \$19,000 annually!

But impressive as it is, that isn't the whole story. For this Model 33 Engine has been the mainstay of the plant—operating more than 96% of the time . . . generating more than 83% of the plant's total load.

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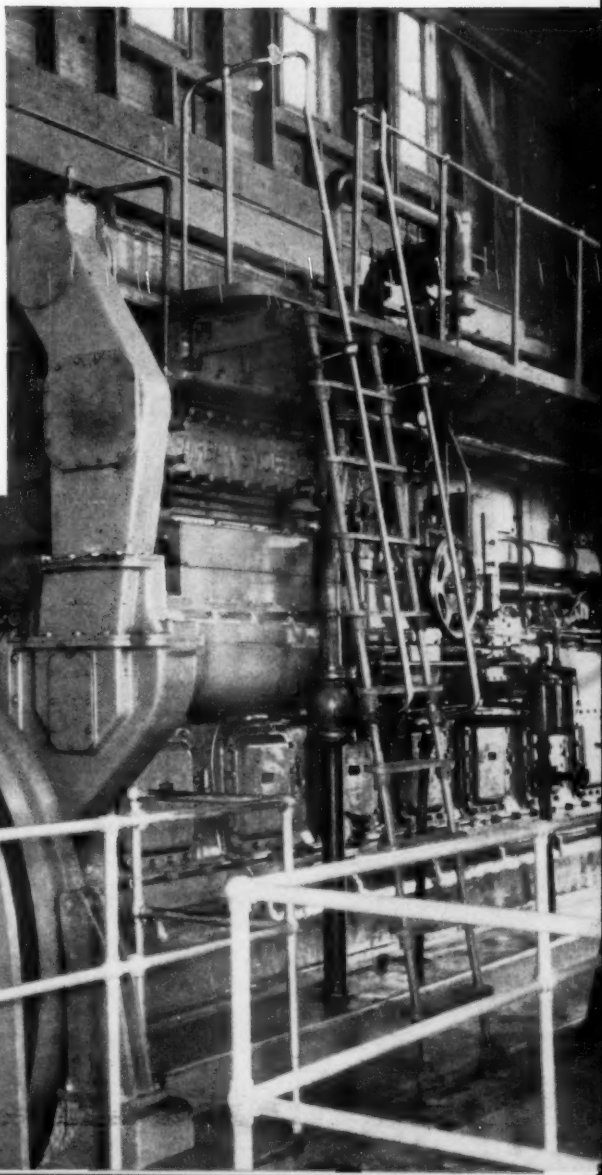
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mixing tanks to a split dose, operating our two softening tanks in series. Lime processing is carried on in the first tank and soda ash treatment in the second. This eliminates lime sludge in our distribution system.—A. S. Hibbs, Manager, Water Works, Chillicothe, Ohio.

FOR ADDING polyphosphates, we use a heavy-duty Proportioners feeder, which has been very satisfactory and requires a minimum of maintenance. The necessity for street openings has been reduced by a Greenlee pipe pusher. Other useful and satisfactory equipment includes: Homelite (3-inch) and Jaeger (1½-inch) portable pumps; a Goldak pipe locator which has more than paid for itself; Mueller tapping machines, B, E and CC, which we could not function without; Clow mechanical joint cutting-in valves, which have our enthusiastic recommendations; a Jaeger 125 portable air compressor; Ford and Chevrolet service trucks; and a dual-drive Delaval pump with a GE motor and a Hercules gasoline engine.—Ervin F. Leist, Public Utilities Manager, Circleville, Ohio.

IN TYING to existing mains, we have found the Strickler pipe cutter very useful in making precision cuts and in saving pipe and labor. An interesting job was unstopping a sewer which was 35 ft. deep. From this 12-inch line we removed a piece of asphalt pavement 18 by 10 ins. We used a Flexible rod, with power drive and winch. All work was done from the pavement.—Thomas C. Parsons, Sup't., Natchez, Miss.

FOR BACKFILLING trenches we used an International TD-6 bulldozer, and we also used it for moving rocks and boulders and for removing dead trees and brush on the watershed. For rock drilling and for pavement breaking we have a Schramm air compressor.—E. H. Sargent, Water Sup't., Wilmington, Mass.

A SCHIELD Bantam backhoe, mounted on a half-track, has been very handy for ditching, setting fire hydrants, laying water main and many other small jobs. This equipment moves quickly from one job to another. We also have an

Allis-Chalmers front-end loader which we use for backfill, trash disposal and snow loading.—Donald Perkins, Sup't. of Public Works, Howell, Mich.

PARK LEAF-raking operations were reduced 60% by use of a hammer head mower (made by Mott of Brookfield, Ill.) to pulverize leaves; a Parker fairway sweeper to rake and stockpile; and a home made pneumatic picker-upper to load trucks.—George L. Oppen, Village Manager, Riverdale, Ill.

WE ARE using, and have used for many years, Roll-on-Joint (mechanical joint) cast iron pipe and feel that we have cut corners in pipe laying costs when compared with calked lead joints.—H. S. Merz, Sup't. of Water, Rockford, Ill.

DITCH DIGGING equipment, we all know, is by far the most effective equipment that can be used in water main construction. However, here in New Albany and Jeffersonville, we have found the Trojan Earthworm boring machine to be a

ALBERT'S "SPEED-LAY" MEETS THE TEST!

Albert Pipe Supply Company's world famous SPEED-LAY Pipe System again proved itself in an actual demonstration of emergency pipe laying by unskilled workers. In the recent Civilian Defense air raid test, SPEED-LAY was used to provide the "bombed" area with a semi-permanent water line. The simplicity with which it can be assembled and broken down, makes SPEED-LAY a must for any emergency where existing permanent installations need temporary, though efficient, replacement . . . water lines for drinking or fire-fighting, air lines, gas lines, and sewage disposal.

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CHRYSLER AIR RAID SIRENS

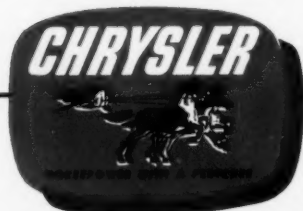
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DETROIT IS PREPARING WITH 20 CHRYSLER SIRENS

As guardians of America's primary target, Detroit Civil Defense Officials are acutely conscious of their city's importance to Civil Defense. They are protecting their homes, children and factories with a modern, up-to-date Air Raid Warning System. They are installing Chrysler Air Raid Sirens. Here's why:

The new Chrysler Air Raid Siren produces the loudest warning sound ever achieved for modern production. It is powered by a new 180 horsepower V-8 Industrial engine, making it *independent of vulnerable central power systems*. One or any number sirens may be *remotely controlled* from a central control station if desired. It is clearly recognized over a diameter of 8 miles . . . and it is the *least expensive, 138 decibels (100 ft. from throat) of warning sound on the market today!*

For complete information, specifications and availability for your city, town or industrial plant write: *Marine and Industrial Engine Division, Chrysler Corporation, 12210 E. Jefferson Ave., Detroit 31, Michigan.*



CITY TO GET RAID SIRENS

First Warning Units to Be Installed in March

Detroit's civil defense program took a step forward Saturday as arrangements were made for delivery and installations of a siren-warning system and the first emergency medical supplies began arriving for distribution to casualty care stations.

Brig. Gen. Clyde E. Dougherty, director of the Detroit Office of Civil Defense (OCD) said the first two of 20 sirens would be installed early in March.

The first installations will be on top the Sheraton-Cadillac Hotel, for the downtown area, and the General Motors Building, for the New Center area.

The siren committee of the Detroit OCD decided to use a new type 180 horsepower unit manufactured by the Chrysler Corp. The choice was made after more than a year of study and comparisons of various warning systems.

Dougherty said about \$100,000 was saved by waiting for the development of the new and better siren.

He estimated that the complete warning system would cost about \$200,000, half of which is Federal funds and half City. All but two of the powerful sirens will be placed on roofs of fire stations.

All sirens will be activated from remote controls.

most effective piece of labor and time saving equipment. We use it for the installation and replacement of water services, particularly under paved streets where pavement breaking would require costly replacement and hinder traffic. We have four of these machines. It is not uncommon to bore 60 ft. in less than 30 minutes, with only about 5% of the bores having to be made the second time. In all cases, the proper drill bit or head for the particular type of soil must be used. One of our foremen developed a bit which we adopted and use for practically all of our work.—W. E. Falk, Jr., Sup't., of Distr. & Production, New Albany, Ind.

WE BUILT A 30½-mile water supply line, capacity 13 mgd.; pipe

sizes were 30-inch, 24-inch, 22-inch and 20-inch. The pipe is steel, coated and wrapped with coal tar enamel and asbestos felt according to AWWA specifications. Cathodic protection is provided using two 25-amp, 25-volt rectifiers.—Robert L. Lee, Ass't. Sup't., Medford Water Commission, Medford, Ore.

A ¾-YARD BACKHOE has been used with good success for digging our trenches. This machine cuts a trench 30 ins. wide and to a depth of 12 ft.; and it will remove 90% of the rocks we encounter. We drill the large rocks or split them if we cannot use dynamite and break them up. We use bulldozers for backfill and tamping.—Wade Geer, Sup't. Water Works, Johnsonburg, Pa.

THE PIPE LOCATOR sold by the Leak Detector Co. has been most useful. I used this to locate a number of service lines that nobody knew the location of or where they ran to. It also helped to locate curb boxes so we could install meters in homes on service lines that did not have any shutoffs inside the homes.—Charles Reich, Water & Sewer Sup't. AT OUR SEWAGE treatment plant, part of our digester and 200 ft. of 6-inch pipe was plugged with sand. We tried flushing with 70-pound water pressure without success. Then we brought in a truck-mounted air compressor and in 2 hours we had our piping open. We removed 30 cu. yds. of sand from the digester.—Herbert DeReuter, Plant Operator, Oak Lawn, Ill.

ICE CONTROL: and A FIELD CAR For Engineering Work

J. HENRY QUIRK

City Engineer, Bradford, Pa.

ONE of our most useful pieces of equipment for ice control is a Highway Equipment Co. Model "E" spreader mounted on a 1½-ton truck. The spreader may be stopped or started while the truck is in motion by means of a declutching device which is operated from the truck cab. The width of spread of material is controlled by adjustable baffle plates surrounding the rotating disk.

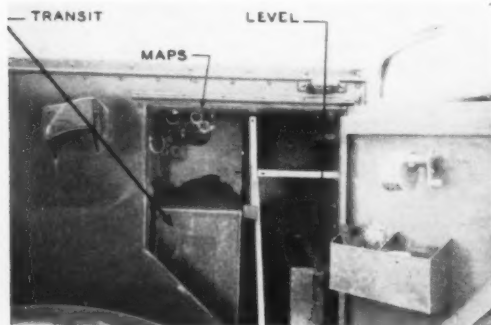
This unit has been very effective during the winter for spreading salt or cinders or a combination of the two. It is operated by one man for either sheet or strip spreading. It

is well adapted to emergency coverage ahead of the regular cinder spreading crews when sudden drops in the temperature create slippery pavements, particularly on steep grades and at important intersections. Last winter we established a night patrol, coordinating this with the Police Department, to meet any emergency. This night patrol required only one man, the operator reloading the truck when necessary from stockpiles by means of a Lull front end loader on a Minneapolis-Moline wheel tractor. In the event of night snow storms, the operator called out the Street Department crews.

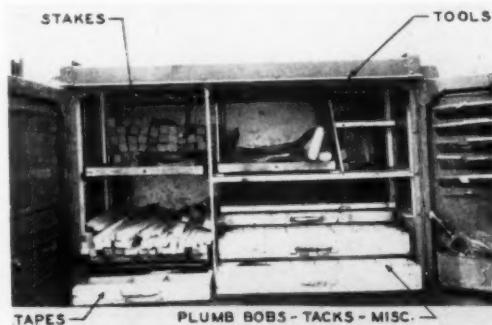
By proper adjustment of the deflectors on this spreader we were

able to spread salt during the heavy traffic hours with minimum inconvenience to the traffic and with no complaints of salt striking passing vehicles or pedestrians.

A field car for the Engineering Department was developed from a used maintenance car purchased from the telephone company. This car was equipped with a metal box with metal drawers and compartments. Sufficient space was provided for all field equipment, such as tools and stakes. A small platform supported on spring coils was provided for carrying the transit and level boxes. Fastened to the exterior and along one side of the box are sheet metal containers for the tripods, level rods and line rods. There is sufficient room in the cab to seat three men. The unit is compact, but provides a proper place for all of the tools and equipment needed, and has proved very satisfactory.



● SIDE VIEW, showing space behind cab for transit, maps and level.



● END VIEW, showing space for the various necessities in field work.

HERE'S HOW FOSTER SIRENS FOR



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TYPE 45
SIREN

**WARNING
SYSTEMS**

Meet CD Requirements:

- *They are **HEARD***

125 to 130 decibels at 100 ft.—High enough to overcome a street or shop level of 70 to 80 decibels with plenty to spare. Non-directional.

- *They are **RECOGNIZED***

Sharp, distinctive howl is instantly identified as a warning.

- *They are **ALWAYS READY***

Start instantly in coldest weather. Simple and rugged mechanically with few moving parts. Practically fool proof.

- *They are **VERSATILE***

Require a steam supply of less than 1500 lbs. per hour at 75 lbs. pressure, available in most laundries, utilities, and industrial processing plants. Can be manually operated or solenoid operated and tied in with other units in the warning system.

Comparative tests show Foster Sirens are lowest in cost per square mile covered. They are simple to install and are low in operating and maintenance costs thereafter.

There are Foster representatives in principal cities. Ask for Bulletin 29.

FOSTER ENGINEERING

835 Lehigh Avenue • Union, N. J.

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ENGINE REGULATORS...PUMP GOVERNORS...TEMPERATURE REGULATORS...FLOAT AND LEVER BALANCED VALVES...
NON-RETURN VALVES...VACUUM REGULATORS OR BREAKERS...STRAINERS...SIRENS...SAFETY VALVES...FLOW TUBES

Now's the time to mail this month's Readers' Service card.

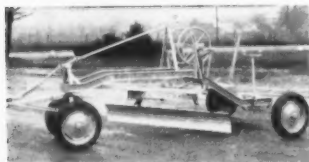
Better Results WITH GLEDHILL EQUIPMENT

From away back the name Gledhill has been associated with road working machinery. Only a few types are shown below. Send for further specifications on any equipment or on the full line.



TRAFFIC LINE MARKERS

New accuracy and economy in painting traffic lines are made possible with this 1952 model. Paints one to three lines in 3" to 6" widths—any pattern. Gledhill engineering and quality fittings put this marker out in front!



DRAWN GRADERS

Shown above is Model 7-A, one of several pneumatic-tired, light graders in the Gledhill line. Leaning wheels, adjustable pitch and blade height, lower price—some of the features of these dependable, general purpose graders.



EARTH MOVERS

A compactly designed, strongly built, reasonably priced earth mover that can be used with any tractor. Has hydraulic controls which regulate depth of cut as well as dumping and spreading. Pneumatic tires. It digs, hauls, scrapes and levels. Available in 1-yd. and 2-yd. sizes.

**THE GLEDHILL
ROAD MACHINERY CO.**
GALION, OHIO

How County Engineers Use Equipment

FOR ROADSIDE SHOULDER and ditching work, Geneva Co., Ala., has found a ½-yd. Link-Belt dragline, mounted on rubber, to speed up work and reduce costs.—John W. Savage is Road Superintendent.

WE HAD A LOT of washed-out culverts in our county last spring and our ¾-yd. Schield Bantam dragline replaced these in a hurry.—M. B. Larsen, County Engineer, Mt. Pleasant, Ia.

DIESEL MOTOR GRADERS are our most useful all-year equipment, especially for gravel road maintenance and for snow removal. A new sheepfoot roller, with tandem 60" by 60" drums, has done much toward producing a better finished road grade by giving us better compaction. Our new Caterpillar tractor and front-end loader, with 1¼-yd. bucket is working out fine as a time and labor saving machine.—Earl Coyne, Highway Superintendent, Aberdeen, So. Dak.

GRADERS ARE OUR MOST widely used equipment and we employ them on widening, cleaning fence lines, shoulders, ditches, scraping roads, leveling patches and making road mix. But we have other highly useful equipment, including a gas chain saw, electric trimming chain saw, scythes, vibrators and a 2-way radio.—Robert T. Carrier, Superintendent, Batavia, New York.

MORE PRAISE has been received by this office for the placement of directional signs than for the reconstruction of any road or bridge. These have been appreciated by the motorists. At present, we are experimenting with an adaptation of a fertilizer drill to be used as a spreader for ice control.—Wm. H. Baum, County Engineer, Woodbury, N. J.

THE MOTOR GRADER is our most useful piece of equipment. It is used more hours in a year than any other piece of equipment, for smoothing surfaces, mixing blacktop, grading and draining, snow plowing and ice prevention. This year for the first time we used a chain saw and found it a great labor saver in our

PUBLIC WORKS for April, 1952

clearing and draining work and on our reconstruction programs. We have devised a one-half blade attachment to be used on motor graders for trenching along old concrete pavements. This is not especially unique, for other counties in this area have similar equipment, but we have found it very useful in working on some 15 miles of highway this year. We recently added a Cedar Rapids aggregate dryer to improve the quality of mixed-in-place surfacing.—E. Francis Brunette, County Highway Commissioner, Green Bay, Wisc.

• • •

Water Softening

(Continued from page 87)

water before it enters the precipitator. If the carbon dioxide content is low, this aeration can be accomplished by allowing the water to rain down over a baffle into the Precipitator. If the carbon dioxide content is high, a coke or wood-slat aerator may be mounted over the treatment unit.

In softening iron-bearing well waters by the zeolite process, the soluble iron is removed, simultaneously with the hardness, by the base-exchanging action of the zeolite. In municipal practice, though, the hardness of the water is usually not completely removed, usually being reduced to about 85 ppm (5gpg). Therefore, the zero hardness effluent is usually mixed automatically with enough by-passed water to produce an 85 ppm hardness in the mixed water.

If the raw water is very hard and the iron content is not very high, this practice may often be carried out without treatment of the bypassed water. In other cases, treatment of the bypassed water may be necessary in order to remove its iron content. With some waters, the by-passed water may have its iron removed by passing it through a manganese zeolite. With others, iron is removed from by-passed water by aeration and filtration.

In most surface waters, iron removal is usually unnecessary. Some surface waters, especially if they originate in swampy areas, may contain organic or colloidal iron. In such cases, coagulation and filtration is employed to remove the iron.

Corrosion and resultant red water troubles may be controlled by vari-

— ROBERTS FILTER

Since our fiftieth anniversary in 1947, many new Roberts-equipped water treatment plants have been installed . . . and in the same period a number of additions have been made to plants that have carried the Roberts nameplate of dependability for many years.

We are proud of this accomplishment; not only because of the total quantity of a billion gallons a day, added in the past five years, but because of the reports we receive from the men who are operating our equipment year in and year out.

MECHANICAL EQUIPMENT
BY
ROBERTS FILTER MFG. CO.
DARBY, PENNA.

— ROBERTS FILTER MANUFACTURING CO.

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ous means. In some cases, treatment of the effluent with small dosages of metaphosphate is sufficient. Adjustment of the alkalinity to give a zero or slightly plus Langelier Index is widely practiced for the same purpose, with or without the addition of a metaphosphate.

Corrosion Control

With the Permutit Precipitator, the effluent produced is in chemical balance so that it is non-corrosive. In other words, the lime removes all of the free carbon dioxide and the process is capable of adjustment so that effluents of different pH values can be produced.

With the zeolite process, adjustment of the pH value may be obtained by feeding small quantities of caustic or caustic and sodium silicate mixture to the mixed effluent. Such additions may easily be made by the use of pressure equipment, thereby avoiding double-pumping.

Today the enlightened public is no longer satisfied with water that is merely bacterially safe, but demands water that is clear, sparkling and soft. The installation of water conditioning equipment is no longer

a luxury, but an absolute necessity for efficient, long term municipal budget planning.

The following are but a few of the savings effected by the installation of water softening equipment:

SAVINGS TO THE MUNICIPALITY.—(1.) Water mains will last longer; no scale will form on the pipes, thereby obviating the necessity of replacement. (2.) Power plant fuel bill will be lower. Hard water forms scale which acts as an insulator—the more scale present the greater the heat required to penetrate the layers. (3.) Pumping station equipment will operate more efficiently.

SAVINGS TO INDUSTRY.—(1.) The life of plumbing fixtures will be prolonged. (2.) Fuel consumption will be lessened. (3.) Extensive savings will be noted in industries using large quantities of soap or detergents—i.e. laundries, cleaning establishments and restaurants. The durability of mechanical devices found in dairies and creameries will be increased and the public will be protected from germs which may lodge in the crevices where curd is found.

SAVINGS TO THE HOME OWNER.—(1.) Soap bills will be greatly reduced. (2.) Automatic washing machines for clothes and dishes will operate more efficiently with soft water. (3.) Plumbing repairs, fuel bills, linen replacement will be reduced.

• • •

Toledo Civil Defense

(Continued from page 78)

Medicine, was projected for 42 treatment centers. Assisting him is Paul Kempe, a hospital superintendent. In these 42 buildings, all located outside of the city limits, we could provide an emergency capacity of approximately 15,000 beds. Additional capacities must be obtained outside the metropolitan area. We are, for example, negotiating with Bowling Green University, some 18 miles from Toledo, where more than 3,000 casualties could be bedded.

Again, we are calling upon the people to supply volunteers for manning the emergency hospitals and to provide certain basic supplies, such as bedding. Medical equipment, drugs and some types of supplies will have to be purchased.



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4 major reasons why Permutit is WATER CONDITIONING HEADQUARTERS

WATER CONDITIONING HEADQUARTERS for 40 years, The Permutit Company pioneered in the application of ion exchange in water treatment. Permutit's *complete* line of water conditioning equipment is engineered and constructed to meet all needs.

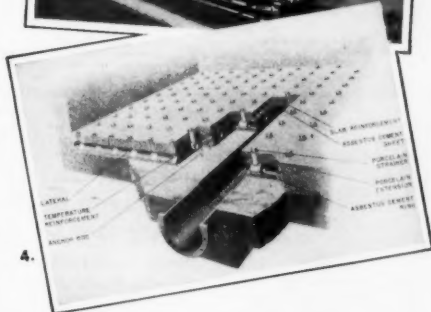
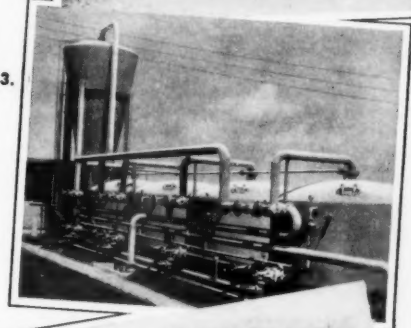
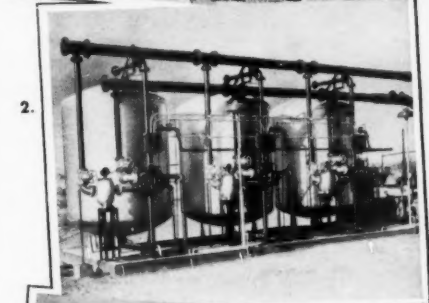
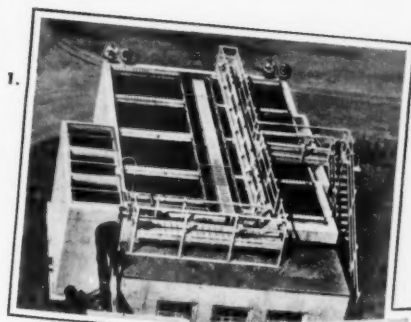
1. PRECIPITATORS—A reaction and settling tank requiring less space, less chemicals and less time than previous designs. Permutit Precipitator softens water . . . removes impurities . . . lowers alkalinity content. Available in sizes having daily capacities varying from *one thousand* to *ten million* gallons.

2. ION EXCHANGERS—Hardness in municipal water supplies is objectionable because of its scale-forming, soap-destroying properties. Hardening elements can be *simply and cheaply* removed by passing water through tanks containing Permutit Zeolites. Water softening occurs when Zeolites attract the hardening ions—calcium and magnesium—and exchange them for sodium ions.

3. SPIRATOR—A *space-saving* cold lime-soda water softener with a new principle—*catalytic precipitation*. Hard water plus chemicals enter shell and swirl upwards through catalyst granules. Precipitates deposit on granules by accretion . . . fall to bottom . . . are drawn off and *easily* disposed of. *Total reaction time is 8 minutes.*

4. MONOCRETE UNDERDRAIN—Non-corrodible monolithic construction is rigid and inexpensive. Large laterals and header consist of conduits cast in concrete . . . assure uniform collection and distribution of water. Laterals are formed by inflatable rubber tubes which are removed after concrete has set. Porcelain extension stems, containing porcelain strainers, extend from header and laterals to concrete surface.

Write for further information on these and other types of water conditioning equipment to The Permutit Company, Dept. PW-4, 330 West 42nd Street, New York 36, N. Y., or to Permutit Company of Canada, Ltd., 6975 Jeanne Mance Street, Montreal.



WATER CONDITIONING HEADQUARTERS
FOR 40 YEARS

PERMUTIT

It's a fact . . . our handy Readers' Service card is the easy way to get new catalogs.

We are in the process of requisitioning approximately \$45,000 worth of such equipment and supplies through the Federal Civil Defense Administration. One-half of the cost will be borne by the city and county, and the other half by FCDA. Because of the assistance we already have received and will receive from the people and because of the simplification and practicality of organization and operating procedures, we are able to keep the cost of basic medical equipment and supplies at a very low level.

Other Divisional Progress

In our other divisions, we are proceeding in a way similar to other cities. The Public Affairs Division, headed by Marden R. Bishop, public relations director of Willys-Overland Motors, Inc., has done an outstanding job in publicizing civil defense in our area. This division is subdivided into three sections; one publicity, at present headed by Mr. Bishop, includes also advertising, art, photographers and radio experts. Another section, on public education, is headed by Asa S. Knowles, president of the University of Toledo; and the third is a speakers' bureau, under Donald

Mills, a staff member of our Chamber of Commerce.

Aside from newspaper publicity, we have our own radio program, a weekly informative forum. For our key personnel, we publish a four-page mimeograph paper; and civil defense speakers have covered a large number of organizations last year.

The Division of Administration, under Edward C. Rundell, is organized basically for setting up emergency administration in case of disaster. While this division is technically responsible for training supervision, actual operations have been delegated to heads of the various components.

The Women's Division, under the leadership of Mrs. Henry D. Cossitt, prominent club woman, has done an excellent job in making women civil defense conscious.

Our Communication Division is not fully organized because we lack equipment. At present, we have no control center, only the space and a paper organization. However, the division director, Robert McClain, of the Ohio Bell Telephone Co., is welding together our available resources, particularly amateur radio

operations, cab companies, motorcycle messengers and foot messengers.

The Transportation Division is under Frederick M. Shelton, a Nickel Plate Railway executive, assisted by Dwight D. Hatcher, executive manager of our automobile club. Each operating railroad has its own plan for disaster operations. In continuous surveys, we are adding constantly to our motor vehicles which would be available for rescue operations. Motor vehicles are being assigned by types and to tasks rather than into units. For example, each medical field team needs two heavy trucks, each of which can transport six or more casualties at a time, and one light truck for utility service. Unit organization is impractical, because these vehicles could be anywhere in the metropolitan area at the time of the attack. Accordingly, we are setting up a number of assembly areas, with the driver of each registered vehicle instructed to report to the nearest such point in case of attack. Dispatchers then would assign them. Private planes are organized under Harry M. Turner, Toledo business man, according to types. The heavy-

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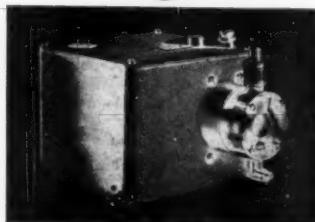
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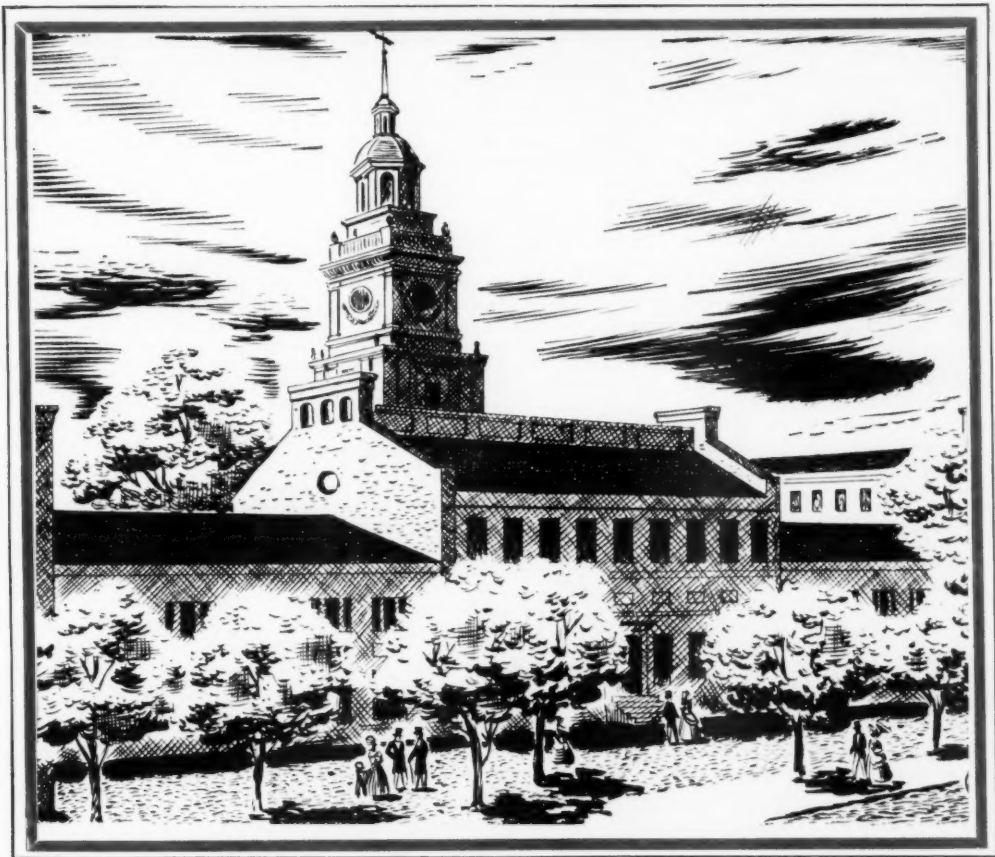
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Philadelphia's Independence Hall, where the Liberty Bell is housed, as it looked 100 years ago

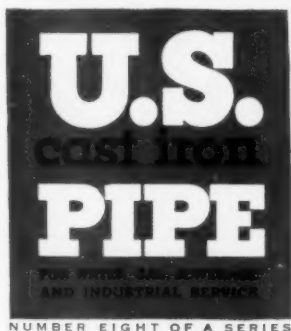
Philadelphia has cast iron water and gas mains in service that were laid well over a century ago.

One of them is America's oldest cast iron water main, still functioning despite the radically changed conditions of street traffic and underground utility services in 100 years. The fact that cast iron pipe, laid generations ago, withstands the shock of heavy-duty traffic and the stresses caused by congested underground structures, amply demonstrates its shock-strength and beam-strength. Because of these strength factors and effective resistance to corrosion, cast iron water and gas mains, laid over 100 years ago, are still serving in the streets of more than 30 cities in the United States and Canada. United States Pipe and Foundry Co.,

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ier planes would carry emergency cargo, particularly blood and medical supplies. Slow planes would be used for observation; and light, fast planes for emergency messenger service.

A public transit section is organized under Charles H. Forsgard, president of the Toledo Community Traction Co.

Our Evacuation Division is organized under Harold Woodruff, president of Kasle Iron & Metal Co., assisted by Edwin M. Warder, another business man. It is concerned principally with post-disaster evacuation. We have designated a considerable number of evacuation assembly points, dividing the city into evacuation zones. Supervisory personnel has been assigned to them. We would use buses for evacuation. The homeless would be evacuated to prearranged emergency housing areas.

We have not done much in mutual aid agreements, which is under the direction of Wayne E. Kakela, executive secretary of the Toledo Chamber of Commerce. We have held one meeting of the civil defense directors of our area. However, we are waiting for the State

to establish a uniform contract form.

Under the Safety Division, headed by Edward A. DeAngelo, are the warden, auxiliary police and fire, light rescue, traffic control and plant protection services.

In the warden service, headed by Arnold F. Papenhagen, deputy fire chief, we have developed a city-wide organization on a skeletal basis. Another training class was started in February. This service is organized on the basis of five sectors, using the area of our five general public high schools; and then into wards, precincts and blocks.

Auxiliary police, under Police Inspector Charles E. Roth, at present are organized into nine companies, including a women's corps.

Fire Services are under Chief Karl Scheidler, with the training and organization of auxiliary fire personnel delegated to District Fire Chief Ewald A. Bode. Our plans call for the evacuation of fire equipment and personnel from the congested areas on yellow alert. Fire Captain Wm. J. Reichard heads a small auxiliary light rescue organization.

By the end of February, we had plans ready for a warning system

and we were hoping that the City Council would approve funds necessary to pay one-quarter of the cost. One-half of the cost is to be paid by FCDA and one-quarter by the State.

Our plant protection committee, under the chairmanship of Melvin C. Byers, of Owens-Illinois Glass Company, with representation from major industries, utilities and the police and fire departments, developed what we believe to be an outstanding plan for plant protection. It will be distributed to industry in the near future.

In co-ordination with the State Police, Michigan authorities and the Area Commander, we have developed an area traffic plan, under the direction of Traffic Commissioner Paul S. Robinette and Police Inspector Edward Hoffman. Certain routes have been designated for one-way emergency traffic, with road blocks established around the city perimeter. Initially, the road blocks would be manned by State Police and later by auxiliary personnel.

Our Medical Services division is under Dr. Walter H. Hartung, city health director. The medical care

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section has been detailed above. Sanitation is organized under Dr. W. S. P. Hall, including veterinary physicians, sanitary engineers and specialists, for functional duties in case of emergency.

We also have a considerable number of laboratory technicians, clinical and other specialists assigned to the hospital section, which is headed by E. W. Paul, a hospital superintendent.

Our radiological section, under Dr. Herbert A. Crandell, is organized into three sub-sections. There is one on monitoring, one on surveying and a third on decontamination. We trained the first two classes with the use of borrowed and improvised equipment. Now, we have six geiger counters. They were made by civil defense volunteer technicians, under the direction of Everett J. Cook, head of a research laboratory, from parts we purchased at a cost of \$222. FCDA price list on geiger counters is \$135 each. Additional training equipment is on order.

Burton H. MacRitchie, city service director, is heading our Public Works Division. The utilities section, under George Van Dorp, city water commissioner, has made substantial progress in security and organization for restoring service in case of disaster. The engineering services have surveyed all available engineering equipment in the area, under the direction of John J. Davis, city engineering commissioner.

In public shelter, we have not made desired progress. The State Legislature has not enacted the necessary legislation to exempt owners of property from liability for injuries incurred on the premises if used as a public shelter. Under the circumstances, I could not authorize placing signs on the streets to invite people to use certain buildings as shelters.

Our Welfare Division is headed by Arthur W. Gratot, city welfare director, with C. Barnes Walbridge and Eugene Shenefield as deputy directors.

The food section, under Carl Fuller, of the Kroger Company, is organized around the Red Cross Canteen Committee. We have trained a considerable number of people in mass feeding.

Clothing and shelter or housing also built around the Red Cross Committees. Buildings in the housing survey made by the Red Cross, which are not used as emergency

hospitals, are being designated as emergency housing areas. This is under the direction of William E. Hallauer of the Board of Education.

A considerable number of social workers who have registered for civil defense are being organized for welfare service under Clarence Benedict, city poor relief commissioner. They would go into action three or four days after the attack.

There is also a record section, under Mrs. Alfred Wagers, of the Red Cross staff. This would set up operations immediately after the at-

tack. The record form we adopted parallels closely a similar Red Cross form.

Heading our spiritual aid section are three co-chairmen. Rev. C. Clark Shedd, Protestant; Msgr. Michael Doyle, Catholic and Rabbi Leon I. Feuer, Jewish. Their function is to provide clergymen for functional duties with rescue components.

The burial section, under Dr. Paul Hohly, county coroner, has not been implemented beyond the formation of committees and primary organization of technical personnel. Here



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It is estimated that the cost of a ground survey on a large flood control project would have been over \$3,000,000 and would have taken over 10 years. An Abrams Aerial Survey cut costs 90%—resulted in savings averaging over \$5,000 a day. Time saved on the project was eight years.

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we need a considerable number of volunteers for burial service, which would be hard labor, and others to be trained in identification. These components have so far failed to attract volunteers. We are, however, activating the identification section under T. Hoyt Boden, who was formerly a quartermaster officer, attached to grave registration duties, and so is well qualified for the leadership of this component.

The city and county are separately organized for civil defense. However, through co-operation and co-ordination, James W. Ault, the

county director, and I are accomplishing a great deal in area planning and organization. We have integrated medical and communication services and traffic planning; and when we install our warning system it will be on an area basis, controlled from Toledo. Also, we will have one control center for the area. For operations, the city is divided into four sectors, radiating outward from the Maumee River. Organization of the area outside of the city limits follow this outline.

The controller is Charles Evans, secretary to the city manager. In

case of disaster, he would co-ordinate the operations of the various services in the disaster area. The map and intelligence officer is Robert F. Foeller, director of the Lucas County Planning Commission. It is his responsibility to determine areas of damage, number of casualties and related matters. Flash dials, to determine the zero point of explosion, have been made by students in our vocational high schools. These will be installed at strategic points. The flash dial is a 24-inch perfectly rounded board divided and marked into 360 degrees, with a projecting stem in absolute center. In case of aerial explosion, the board would be scorched, except the area shadowed by the stem. Knowing the locations of the dials and the azimuth of the shadowed parts on two or more units, zero point could be obtained very quickly by the process of triangulation. Knowing the population and building concentration of the destroyed and damaged area, the damage and casualties can readily be estimated. Of course, accurate information must be obtained from wardens and reconnaissance teams.

Financially, we have had a very economical administration. We spent approximately \$26,500 in 1951. Included in this figure are the costs of office alterations, rents, janitor service and office equipment, aggregating \$8,000; \$1,000 was spent for training equipment and some \$1,100 for arm bands and identification cards.

What will 1952 bring? No one can know that. We can only hope and pray that the human mind will find ways and means to avert war and to divert atomic power from its projected path of destruction into peaceful channels for the benefit of mankind; and, should we fail in that, that civil defense be ready for the protection of the home front in case of war.

• • •

Fluoride Testing

(Continued from page 94)

increase of 0.5 ppm fluoride. Sulfate can be reduced below 200 ppm by precipitation with barium chloride and subsequent removal of chloride in excess of 500 ppm with silver nitrate. The nitrate ion that results is not known to interfere with the fluoride test and if an excess of silver nitrate is avoided there will be practically no silver ion in solution.

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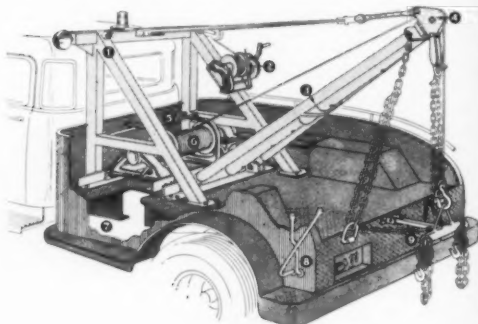
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amounts in excess of 500 ppm before interference is noted because the high concentration of hydrochloric acid in the Sanchis-Scott fluoride reagent represses chloride interference. Beyond this point, chloride causes an apparent decrease of 0.1 ppm fluoride. Excessive amounts of chloride may be reduced to values below 250 ppm by precipitation with silver nitrate. Excess silver nitrate should be avoided.

Turbidity and Color do not affect the fluoride determination when commercial testers are used because of the compensation feature already described. Chemical coagulants should never be used to clarify samples taken for fluoride tests.

Additional color discs, each containing ten permanent color standards, are available for use with the Aqua Tester for more than 25 other important water tests including: pH, aluminum, ammonia nitrogen, calcium, chlorine, chromium, color of water, copper, dissolved oxygen, iron, lead, magnesium, manganese, nitrate nitrogen, nitrite nitrogen, phosphate and metaphosphate, silica, and sulphides. Many of the interfering substances described above can be quickly and accurately determined with these color discs. As in the case of the fluoride determination, these color discs make the preparation of temporary standard solutions unnecessary and greatly facilitate accurate water testing by plant operators. Frequent testing is essential to proper fluoridation, and modern equipment makes it possible for even the smallest water laboratory to perform accurately its own control tests with complete assurance.

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PUBLIC
WORKS

DIGESTS

THIS section digests and briefs the important articles appearing in the periodicals that reached this office prior to the 15th of the previous month. Appended are Bibliographies of all principal articles in these publications.

WATER WORKS 121
HIGHWAY AND AIRPORTS 129
SEWERAGE AND REFUSE . . . 137

THE WATER WORKS DIGEST

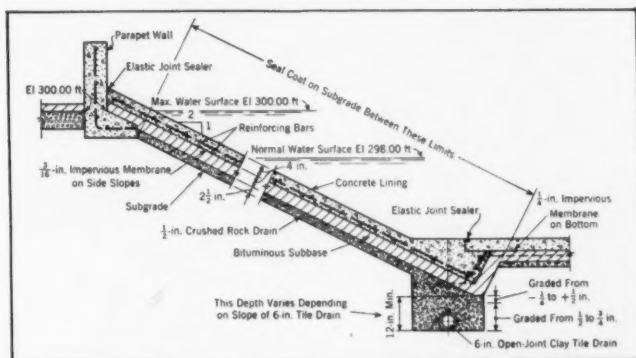
Applying Copper Sulphate to Reservoirs

Oklahoma City has two surface reservoirs of 1700 and 2500 acres area, respectively. It uses copper sulphate to control the plankton growth in the lakes and the Sissile algae growing on the riprap. To distribute the copper sulphate solution in the lakes, they use a stainless steel pressure tank of 70 gals. capacity, a 15-gpm gasoline-driven pump which pumps lake water through the tank (in which is placed 400 lbs. of small-crystal copper sulphate), from which it is forced through 25 ft. of 1½-in. to ¾-in. distributor pipe extending each side of the boat. The distributor pipes contain orifices at 2-ft. intervals. This equipment is installed in an aluminum boat 16 ft. long, with outboard motor. There has been some corrosion of the boat by the sulphate. For treating rocks above the water edge, the copper sulphate crystals are broadcast over them and later are dissolved by wave action.

M. B. Cunningham—"Equipment for Applying Copper Sulphate to Surface Reservoirs," *American City*, February.

Constructing Impervious Reservoir Linings

The East Bay Municipal Utility Dist., Calif., has had unpleasant experiences and money losses due to reservoir leakage, and when planning the Seneca Reservoir, recently put into operation, they tried to provide satisfactory water-tightness at comparatively low cost, and were successful. The soil was so porous that during excavation of the res-



Courtesy Journal AWWA

● **TYPICAL section of lining of Seneca Reservoir.**

ervoir, rain water that fell into it disappeared quickly and reappeared in springs below the reservoir. After 10 months of service since completion there has been no measurable leakage and no water emerging as springs where it had previously. The cost of features producing water-tightness was 16% of the total cost of the reservoir—\$550,000. The method adopted was as follows: 1—The subgrade (slopes and bottom) were covered with a seal coat of emulsified asphalt, sprayed on and dusted with sand. 2—A drainage system of a 2½ in. blanket of crushed rock on the bottom and slopes of the reservoir, draining to tile drains in the bottom of the reservoir discharging outside the reservoir. 3—A compacted base 4-in. thick of rock aggregate stabilized with emulsified asphalt. 4—An impervious membrane 3/16 in. thick was placed on the sloping banks and ¼ in. thick on the floor, constructed

of an asphalt emulsion containing asbestos fiber—"Laykold Weathercoat." On this membrane was laid a 4-in. concrete slab, with contraction joints 12 ft. apart. The banks of this reservoir sloped 2:1. It is planned to construct several others of this same design but with 2½:1 slopes to facilitate construction.

James W. Trahern—"Design and Construction of Impervious Membranes for Excavated Reservoirs," *Journal, American Water Works Ass'n*, February.

Testing and Repairing Meters

The San Francisco Water Dept. has written exacting specifications for water meters, in doing which they consulted various meter manufacturers. These specifications call for clearance between the chamber seats and disk assembly of 0.004 to 0.006 minimum and 0.006 to 0.008

maximum for $\frac{3}{8}$ in. to 2-in. meters respectively. The clearance between the disk plate and chamber walls should be 0.0025 in. for $\frac{3}{8}$ -in. to 1-in. meters, and 0.0050 in. for 1½ and 2-in. meters. The difference in diameter between the upper edge of the chamber seat and the disk ball should be 0.002 to 0.003 in. The maximum head loss for various flow rates through meters of different sizes and the allowable efficiency variations are specified. To permit the department's testing laboratory to check the meters received as to these requirements

necessitates special precise equipment, some of which was designed by the laboratory. For example to determine flow rate, the time is noted for a given amount (as measured in a calibrated tank) to pass through a meter. To measure this time exactly, electric connection with an electric clock with a sweep hand starts the clock instantly when water is admitted to the meter and stops it instantly when the valve is closed. To measure dimensions, instead of using micrometers, dial indicators in conjunction with specially designed instruments are em-

ployed. The various devices and methods of using them are described in this article.

Oscar G. Goldman—"Testing and Repairing Small Water Meters;" *Journal, American Water Works Ass'n*, February.

Selecting a Consulting Engineer

A water department in a small town, in selecting a consulting engineer, should obtain schedules of engineering fees from the A.S.C.E. or state society of professional engineers. An engineer who has previously given good service to a client, even on small jobs, will naturally best understand that client's problems. Largeness in an engineering organization may be a detriment on small projects. Advantages of cost and availability are with the engineer nearest the client. State registration of an individual as a professional engineer does not necessarily mean ability and experience in water works design. Engineers who practice in a broad field should generally not be selected for specialized design. Rapidly expanding engineering organizations should be avoided, for qualified extra design help in these days is practically nonexistent. The best recommendation of an engineer is continuous service to clients and repeat performance for them. Opinions of water works managers who employ consulting engineers are worth much more than those of governing bodies. Price should not be a basis of selection; qualified engineers accept standard fees. Even with perfect plans, omission of suitable engineering supervision of construction is false economy in the extreme.

Grant S. Bell—"The employment of Consulting Engineers by Small Water Utilities;" *Journal, American Water Works Ass'n*, February.

Engineering Problems in Water Fluoridation

Engineers concerned with the design of the average fluoridation installation will be obligated to provide satisfactory solutions to the questions: 1—How much fluoride should be added? 2—Which fluoride compound should be used? 3—How should fluorides be fed? 4—Where should they be applied? 5—How should operators be protected? 6—How should the fluoride concentrations be controlled? Under 2, the author discusses the cost and solubility of the different compounds,



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the space required for storage and feeding, their corrosiveness and incrustation. Under 3, he discusses the relative advantages of the different types of feeders. Control requires periodic fluoride determinations of representative water samples at least once a day, and checking the total amounts of fluoride applied and of water treated during a given period.

F. J. Maier—"Engineering Problems in Water Fluoridation," *American Journal of Public Health*, March.

Poisoning By Algae in Water

Since 1878 there have been reported many cases of poisoning of animals, fish, ducks and birds of which it was thought the cause was algae, usually blue green. No cases of human poisoning have been reported, but it is considered probable that 8,000 cases of intestinal disorders in Charles Town, W. Va., in 1931 were due to toxins from blue-green algae. These were present in unusual numbers in the river from which the town obtained its water supply. The filter plant was run faultlessly and the state health department reported the water to be free from coliform bacteria. In most if not all cases where death of animals has been attributed to algal toxins, they have drunk water at points where it was covered with a thick "bloom" or scum of algae. Numerous reports of animal poisoning and laboratory investigations leave little doubt that some of the blue green algae under certain conditions of weather, season, rainfall or other unknown stimulant, do at times excrete a potent toxin capable of killing animals in a short time. The chemical nature of the toxin has not been determined, although it is generally conceded to be water soluble, heat stable, either wet or dry, and resistant to extreme pH changes.

Robert M. Scott—"Algal Toxins," *PUBLIC WORKS*, March.

Economics of Meter Testing

To establish a basis for investigating the economic soundness of the present routine for testing $\frac{1}{2}$ -in. meters (once every 10 yr. of service), Winnipeg, Man. made an analysis of 25 meters chosen at random from each of eight groups, classed by age in 5-yr. intervals from 10 to 45 yrs. of age in service.

These were tested for accuracy. Of those 10 yrs. old, the average under-registration varied from 1.0% at 10 gpm to 31.7% at $\frac{1}{4}$ gpm. Of those 45 yrs. old, the average under-registration at 10 gpm was 7.95%; at $\frac{1}{4}$ gpm only two of the 25 registered at all. There was a straight line relationship between the number of meters in each class not working, and the years of their service. A calculation was made of the money loss in water rates for each percent of underregistration; and of the average cost of removing and repairing a meter. Various adjust-

ments of figures were made; for example, if a meter in services does not register, the consumer is charged for that quarter on a flat rate basis and the calculation is adjusted accordingly.

Thus the average loss of revenue for each age-class of meters was calculated. It was found that in 1951 the average cost of repairing a $\frac{1}{2}$ -in. meter was \$15.02. Curves were plotted of the probable loss of revenue and for the average cost of maintenance. These intersected at the 14-yr. line. (For 1941 costs it was the 10-yr. line.) They there-

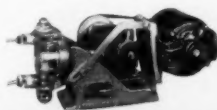


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fore decided to extend the routine test period to 14 yr.

W. L. Wardrop—"The Economics of a Meter-Test Program;" *Journal, American Water Works Ass'n*, February.

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Utility Dist. February, Pp. 161-164.
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Venturi Meters). By Laurie M. Leadon,
Constr. Engr., Div. of Water, Newark, N. J.
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Toxic Plankton. By Theodore A. Olson, Assoc.
Prof., Univ. of Minnesota. February, Pp.
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posium. February, Pp. 78-82.
Cathodic Protection of Steel Underground.
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Water Works Engineering

Copenhagen Water Supply. By Søren Anker-
Rasmussen. February, Pp. 120-123, 156.

Composting and Incinerating Refuse

Two studies on incineration of municipal refuse and an experiment in composting organic refuse are reported in the "News Quarterly" of the University of California Sanitary Engineering Research Project at Richmond, Calif. Technical Bulletin No. 5 deals with the factors involved in refuse disposal by incineration. Bulletin No. 6 covers performance tests on incinerators and is based on studies made at Signal Hill, Beverly Hills and Pasadena municipal incinerators. Single copies of these bulletins will be sent free on request.

In experimenting with seeding of garbage in order to shorten the time required for composting and to insure that the process will proceed properly, it has been demonstrated by the project that rapid composting is possible without inoculation. A 1½ cubic yard open composting bin was built in an unheated warehouse, using 1-inch dressed lumber as side walls. The bin was charged with a chopped mixture of vegetable waste, paper, and partially spoiled citrus fruit to a depth of 34 ins. The mass was turned by hand daily. On

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the third day, the loss in volume was made up by a new charge of similar wastes which were chopped and then mixed with the original charge by turning. The pile maintained a satisfactory composting temperature (50 — 60°C.) within 2 inches of the exposed surface in spite of air temperatures ranging from 5.5 to 11°C. The material appeared to be satisfactorily composted on the eighth day after the initial charge was placed.

Feeling that a simple and inexpensive means of judging composts and composting processes is necessary to make composting practical, studies were continued on methods for analyzing composts. The increase in ash shows the greatest promise of fulfilling the "practical" analysis requirement. The initial ash content of an organic material appears as one of the residues of decomposition. For this reason there is a good possibility that the percentage increase in ash, calculated on a dry basis, may serve as a satisfactory index of decomposition, although the carbon-nitrogen ratio is undoubtedly the best basis for judging the extent of decomposition.

During recent months it has become apparent that analyses of ash, carbon, and nitrogen should be made on as large a scale as possible if results are to be reproducible within reasonable limits. Experiments on sample size and on various methods of homogenizing a sample of organic matter have been found necessary and are being continued.

Property Location and Mapping

The Knox County Planning Commission, according to the Tennessee State Planning Commission, has just begun its most ambitious program to date—it will locate and map every parcel of land in Knox County outside of Knoxville. There are an estimated 34,000 parcels of property in an area of 530 square miles.

Two draftsmen are preparing 105 base maps at a scale of 1" equals 500'. Aerial photographs at the same scale will be used for all field work; to identify pieces of property field crews will contact each landowner, and have him indicate his boundary lines on the aerial photograph. Much checking and rechecking of boundary lines will be necessary. All available material will be used to check ownership, and three years will be needed to complete the job.



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Critical Materials in Waterworks

(Continued from page 72)

fective maintenance program since many of the procedures are no more than a checkup to see if something is wrong; and like the activities of the Health Department, little can be proved except that an epidemic did not occur. Certainly any water superintendent will subscribe to the fact that a pump or motor failure at the wrong time is disastrous and if the possibility of such a failure can be reduced to a minimum, it

is worth the effort and expense necessary to establish an effective maintenance program. We had a classic example in Dallas of a failure which preventive maintenance could have prevented. Immediately preceding our last year summer demand, the flocculator blades at our water plant failed and destroyed an entire battery of flocculators. The cause of this failure could be attributed primarily to a loosening of

flocculator blades causing an eccentric thrust upon the paddle structure. As a result, one paddle failed and knocked the wooden baffle walls into the rest of the flocculators. Had this failure occurred during the July or August period when the plant was called upon to produce over its rated capacity 24 hours per day, it would have produced a major emergency. Good preventive maintenance could have prevented this failure to begin with.

A comparable example came to light recently when we began a preventive maintenance program at our sewage treatment plant. One of the scheduled maintenance checks called for draining a settling basin containing mechanical sludge collecting mechanism. Our inspection showed that at least three of the wooden flights would have come loose in the very near future causing considerable damage and additional work. This failure could have occurred at a very inopportune time; however, with preventive maintenance we were able to select the time when the tank could be drained. Preventive maintenance simply means that you are riding the job and the job is not riding you. You pick the time for shut-down and have time to order materials for foreseeable replacements.

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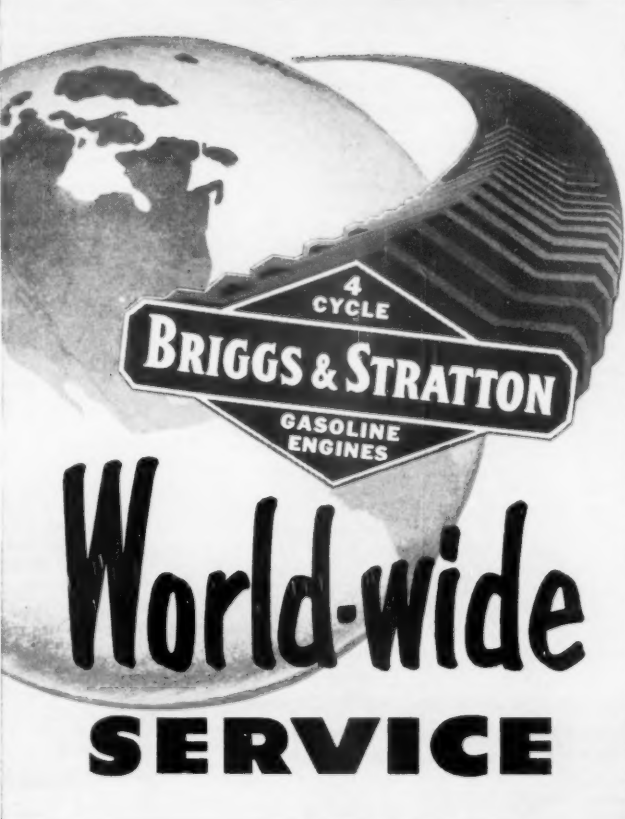
An added advantage of a maintenance program lies in recording each and every repair made to a piece of equipment. Thus you have an experience record on the comparative cost of maintaining one type of equipment against another. Every municipality is faced with the problem of competitive bids. Most every one of us wish, at one time or another, that we had the freedom of a private utility to select our materials or equipment, even at a higher cost; or that we had sufficient information available with which to convince the City Council that the high bid was the best bid. A good preventive maintenance system coupled with good records will give you this. It will lend assistance toward standardization of equipment. This not only allows selection of equipment which is known to give minimum maintenance costs, but permits reduction of repair parts inventory. Even in the best of times, obtaining repair parts for off-brand equipment is difficult; and in times such as these it is often impossible.

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in our city of the advantage of standardization and purchase of high quality merchandise is in our meter shop. For the past fifteen years, we have obtained our meters by contract from the same firm. As a result, even with a program which calls for replacements and overhaul for each meter in our system every seven years, we find it necessary to carry an inventory of only approximately \$15,000, or less than 12¢ per meter in service. This figure is further reduced by the fact that we employ a machinist in our meter repair shop who makes many of the replacement parts from barstock at a price considerably under the charge for a finished replacement part. Our total budget for the meter repair shop, serving more than 131,000 accounts, is approximately \$32,000 per year for personnel and \$7,100 for repair parts, an annual cost of approximately 30¢ per customer. The cost of 30¢ is returned to us in revenue through elimination of sticking and slow meters. The further saving on inventory starts from that point. Of course, there is not much to be done in regard to standardization of equipment presently installed, but if a new facility is being planned, consider at this time what your replacement and maintenance problems will be for the future.

Materials Handling

Any consideration of materials should include a discussion of the materials handling problems. We have given much consideration to this factor in Dallas, both from the standpoint of machinery to speed up materials handling and to decentralization of our stores facilities to make them readily available to every area in the city. We are presently operating three yards, and are engaging in the construction of an additional yard which will function not only as a store yard, but as a sub-office from which equipment can be dispatched. Even the small city of 20,000 should give consideration to the possibility of storing materials at strategic locations throughout the city to reduce to a minimum the time required for trucks to return for materials not anticipated in the morning assignment of jobs. These yards must be enclosed to prevent theft and should be inventoried at regular intervals. Obviously, the saving in crew time must be weighed against personnel and capital costs required for this establishment.



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In this same connection, with a shortage of materials and a ready market from junk dealers for lead and copper, it is well to consider the control of these materials when they are issued to a repair truck. Job tickets should be closely checked against issuance of these materials. We are presently engaged in redesigning our truck bodies in order that high costs or scarce items can be controlled and inventoried on the truck. It is essential that each truck foreman or crew chief must be able to keep such controlled materials under lock and key if he is to be held accountable for them. I am sure that, in any water department where a number of trucks are parked together with materials available to anyone passing by, a certain amount of "borrowing" will take place unless truck bodies are designed to prevent such action.

In cooperation with our stores department, we are providing locked bins on trucks to hold certain types of materials such as corporation cocks, brass wheel valves and copper tubing. With locked compartments provided to accommodate a standard supply level of

such items on each truck, not only will the crew foreman know how many he has of each one of these items and where to find them, but stores can automatically issue to him a certain number of these items each morning based on the materials reported used on his previous day's job. Thus if each truck is equipped to carry a standard supply of eight corporation cocks and the job tickets shows that two such installations were made on the previous day, he will be issued on the following morning from stores two additional corporation cocks whether he has need of them on that particular day or not.

With this method, the truck may be inventoried at any time by checking the "issue" against job tickets and the "on hand", to determine whether or not any material has been lost or misplaced. This system of supply works in well with a bin system whereby a stores clerk is kept on duty at night to study each job ticket and reissue to the predetermined level such materials. Also, a procedure can be set up whereby the crew foreman receives his assignment for the following day upon his return to the job in the evening.

He can then make out his request for materials for the next day and quickly pick them up from his bin in the morning, plus replacements of truck inventories, without the usual morning rush at the store room. It is better to pay for night stockroom help and perhaps an additional half hour overtime for the crew foreman than to hold an entire crew waiting issuance of supplies. So the adoption of better issue methods and improvement of service trucks design not only improves the efficiency of the department but will prevent the loss of critical materials.

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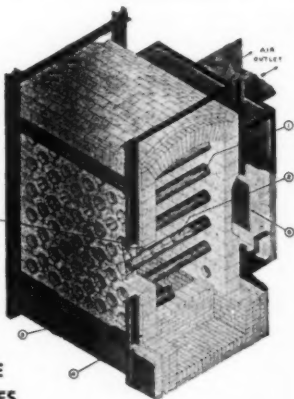
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**Mechanical
Equipment in Ohio**

The Ohio Dept. of Highways uses a number of cranes with clam buckets and drag buckets for cleaning ditches; backhoes for trenching for pipe; and gasoline-powered chain saws for bridge work and tree maintenance, but for the latter is purchasing pneumatic-powered saws as lighter and safer for carrying up a tree. It has built several dozers mounted on mowing machine tractors for dozing back berms under and back of guard rails. For centerlining they use a large truck that carries several hundred gallons of paint, and two smaller ones that carry 120 gallons. The department has quite a number of small tandem driven power graders of the 8,000-lb. class. It has developed a new type of dump body for two-ton trucks with a long bottom that can dump directly into a spreader box without using aprons. It obtains excellent service at low maintenance cost from full-hydraulically driven sickle-bar type, tractor mowers and has purchased thirty more this season.

L. F. Schaeublin—"Equipment Applications in Ohio, Maintenance," *PUBLIC WORKS*, March.

**Reducing Costs on
Roadside Developments**

In Ohio, "the use of mechanized equipment has been the largest single factor in reducing roadside-development costs." Erosion of soil accounts for a large share of highway maintenance problems. It is effectively combated by use of grasses and vines, with trees and shrubs to hold cut slopes, embankments and stream banks. An entire seeding job can be done by machine. The seed bed is prepared by using a rotary-type mixer. Next, seed and fertilizer are applied by using a floss rig, and a straw blower covers the area with a straw mulch. Final

processing with the rotary-type mixer leaves enough soil scattered through the straw to keep it in place. If the ground is friable, there is no seed-bed preparation but seed, fertilizer and straw are placed on top of the ground and the rotary mixer is run over the area. If the area to be seeded is too steep for a rotary mixer, a light coat of cut-back asphalt is sprayed over the straw mulch. Instead of straw, latex, ground corncobs, or sawdust has been used. Where immediate protection is needed, before the seed can germinate and grow, sod is used. On slopes, farm wire is laid on the ground and anchored by stakes, and the sod laid on this and pressed down into it. Vines root deeper than grass—an advantage in keeping slopes from eroding. For planting vines and trees, cost can be reduced greatly by using mechanical hole diggers. Trees are good to stop erosion where gullies are apt to form; make good guardposts, being firmly anchored and requiring no maintenance; and are sometimes used instead of snow fence. Erosion of stream banks has been prevented by laying willow branches on the bank at the base, with their lower ends in a trench, placing a straw mulch over them, and holding all down by wire fencing over them.

Wilbur J. Garmhausen—"Want to Reduce Maintenance? Roadside Provide the Key;" *Better Roads*, February.

**Quick Determination of
Density of Bituminous Concrete**

The Ohio Dept. of Highways has been using hot-mixed hot-laid bituminous concrete in increasing quantities and in 1951 placed more than 1,500,000 tons of it. Controlling the density of such pavements when constructing them is difficult because, using standard methods, a project may be completed before the results of core tests are known.

If the information could be obtained at the time of construction, the engineer could regulate or modify the rolling procedure to secure satisfactory density. The department has worked out a method of doing this, taking an undisturbed pavement sample directly after the surface has been finished by rollers. A small area where a sample is to be taken is frozen by placing dry ice on it, and a 4-inch core removed with an abrasive core drill. It requires 5 to 10 minutes to freeze a depth of 2½ to 3 in. of freshly finished pavement, and 10 minutes to cut a core. The cores are then weighed in air and in water and the volume and density calculated. (This year the time consumed in volume determination will be greatly reduced by use of a volume meter). The tests were made on the job by a traveling laboratory mounted on a 1½-ton truck chassis. The complete process as employed in 1951 required 2½ to 3 hours. Samples are taken from areas where low densities are likely to occur, as along longitudinal joints and near the edges of a paver spread.

H. R. Craig and F. W. Kimble—"Mobile Density Control Unit Helps Check Bituminous Concrete During Construction;" *Roads and Streets*, February.

**Hardening a
Water-Logged Base**

The Cairo, Ill. Airport lies in bottom land where the groundwater table is near the surface. In constructing the runways in 1950, 14 in. of local pit-run gravel was placed on the graded subgrade. It was difficult to compact the gravel on the wet subgrade. All areas were given a bituminous surface seal ¾ in. thick, but the surface soon began to break up, and in 1951 it was decided to place a 1½ in. hot-mix bituminous top on all areas. Attempts to first compact the base were unsuccessful until portland cement was added—about 8% of



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the compacted material. This produced a hard and stable base in a few days. The cement was spread in 10-ft. widths on the old base, which was then scarified, mixed by a traveling mixing machine to a depth of $5\frac{1}{2}$ in., followed by a rotary speedmixer until there was a thorough dispersion of the fines and a uniform incorporation of the cement. Then it was rolled with a sheepsfoot roller, shaped to grade, rolled with pneumatic tires followed by steel rolls. A seal coat was applied and the airport opened to traffic. It is intended to place the bituminous top over the whole area of 41,000 sq. yd. in the summer of 1952.

Norman C. Bird—"How to Harden an Airport Runway Base;" *Engineering News-Record*, March 13.

Settlement of Fills on Compressible Soils

The author describes the method of making a settlement analysis for a proposed fill which will furnish the design engineer with information on the total probable amount of settlement and a prediction of the time required for completion of the settlement. Essentially the analysis consists of three distinct parts: 1—Determining the soil profile and the properties of the soils encountered at the site. 2—Analysis of the subsurface pressures within the compressible layer or layers induced by the weight of the overlying soil and the weight of the fill. 3—Using the one-dimensional consolidation theory and data from the first two parts. In computing pressures within the soft layers due to the weight of the fill, use may be made of the Newmark equation for elastic materials and the Westergaard formulas for material reinforced laterally. In estimating the total settlement, both the void ratio method and compression index method are used.

R. L. Sloane—"Settlement Analysis for High Fills on Compressible Foundation Soils;" *Roads and Streets*, February.

Solving a Slide Problem

The most serious slide problem and the most difficult of the many solved by the California highway department was caused by the sliding of a mass of earth 300 ft. wide extending 800 ft. up the hillside to an elevation 300 ft. above that of the road. This occurred on the

morning of Saturday, Dec. 9, 1950. It completely obstructed a 4-lane side-hill road that carried a Monday volume of traffic of 30,000 vehicles, with no detour that did not increase the distance by at least 15 miles. The road was buried under 30 ft. of earth at the center line and for its entire width. The earth from which the slide had come was still unstable, and only the mass already on the road, which served as a buttress, prevented a still greater slide from occurring. This buttress was left on the road, therefore, until the danger of a further slide could be eliminated. The immediate necessity of opening the road was met by building a detour 600 ft. long around the toe of the slide. By Sunday night 9,000 cu. yd. of material had been moved and graded for a 4-lane road, and was surfaced during the night and opened to the commuter traffic at 5 o'clock Monday morning. Then measures were started to stabilize the hill side by intercepting surface drainage and providing subdrainage by horizontal drains at several levels; the soil conditions first being investigated by vertical and horizontal drill holes. At first 14 horizontal drains totaling 2,000 lin. ft. were driven into the hill at roadway level and discharged 85,000 gpd of ground water. Further work was postponed until the dry season, studies and detail plans being made meanwhile. Four months later the remaining work was started. An interceptor trench 200 ft. long and 15 ft. deep was dug and horizontal drains installed at different elevations in the slide. To date 95 horizontal drains have been installed with an aggregate length of 10,000 ft. and delivering 135,000 gpd. More drains are to be installed this year. The cost to date has been \$160,000.

E. W. Herlinger and Gifford Stafford—"Orinda Slide; Installation of 95 Horizontal Drains Was Monumental Project;" *California Highways*, February.

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The Maintenance of Highway Bridges. By H. H. Bird. Feb. 20, Pp. 11-19.

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Our Largest Airport (O'Hare International). By Philip L. Hirsch. March, Pp. 39-41.
Equipment Applications in Ohio Maintenance. By L. F. Schaeublin, Asst. Dir., Ohio Dept. of Highways. March, Pp. 47-48.
Colorado's Avalanche Control Program. By J. M. Armstrong. March, Pp. 50-51.

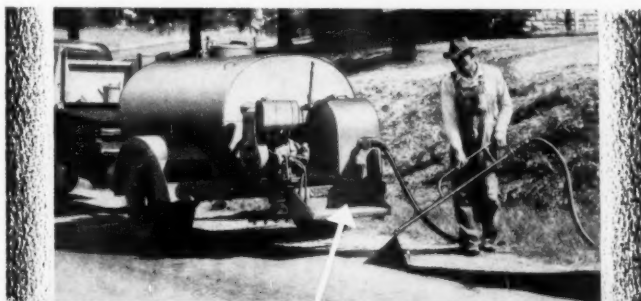
Fast and Low-Cost Snow Removal. By Leon C. McKeon, Road Supervisor, Sussex Co., N. J. March, P. 59.
Street Improvement Specifications for Subdivisions. March, Pp. 60, 62.
County Road Construction with Emulsified Asphalt. March, Pp. 71-72.

The Surveyor (England)

Luminous Traffic Lines. Feb. 2, P. 78.

Stripping in Bituminous Pavements

Stripping in bituminous pavements was discussed in two papers before the Highway Research Board in January, 1952. Frederick C. Sanderson, School of Civil Engineering,



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Cornell University, stated that stripping occurs most frequently when sandstone, chert, or any rock classified by the geologists as acidic is used as aggregate. Limestone, dolomite, and the basic igneous rocks cause relatively little trouble. Unfortunately, limestone and the basic igneous rocks are not readily available in all localities where bituminous pavements must be constructed.

The siliceous rocks are hydrophilic, that is, water attracting, while limestone and the basic rocks are relatively hydrophobic. If an

aggregate which is hydrophilic could be treated to make it hydrophobic its resistance to stripping when coated with asphalt would be greatly improved. He described a method for coating a hydrophilic aggregate with a very thin, tightly bound film of silicone resin which will present a hydrophobic surface to the asphalt. The aggregate is exposed in a surface moist condition to the vapor of a mixture of methylchlorosilanes. The methylchlorosilanes react with the film of moisture on the aggregate to form a coating of silicone resin with a

thickness of the order of a few hundred molecules. After exposure to the vapor, the aggregate is strongly hydrophobic.

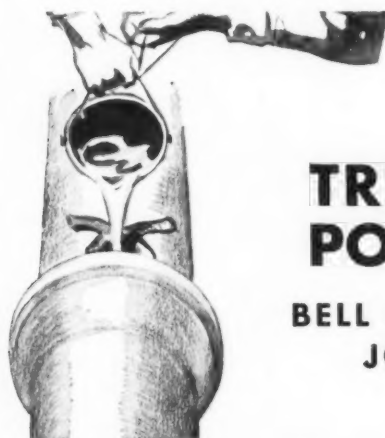
R. G. Hennes, Prof. of Civ. Eng., Univ. of Michigan, said that stripping can be largely eliminated by use of a macadam-type aggregate with a sand-asphalt filler, which assures adequate stability by preserving the mechanical interlock of the coarse aggregate. At the same time, since the sand filler is not essential for stability, it can be impregnated with enough asphalt to provide protection against stripping. This theory was tested in the laboratory by triaxial compression tests and beam tests, using rounded gravel as coarse aggregate, which provided a more severe check. From this investigation it was concluded that:

1. Adequate stability can be obtained in a mix where the voids between interlocking coarse aggregate are filled with a plastic matrix of sheet asphalt.
2. Such mixes are stable over a wide range of asphalt content. This fact permits use of sufficient asphalt to provide protection against stripping.
3. Rounded gravel is a satisfactory aggregate in this type of mix.
4. A square beam makes a good test specimen because the method of compaction can closely simulate ordinary construction practice in rolling.
5. Lack of cohesion is accompanied by increased shrinkage.

• • •

Making a Fill on 85 Feet Of Mud

In 1922 the California Division of Highways built a section of road across low land adjoining Tule Lake which was flooded 10 to 15 ft. deep during the rainy seasons. The fill for this road was overtopped by 4 or 5 feet of water during floods, and settled continuously into the soft ground. By 1950 it had settled 5 feet and it was decided to raise it 13 feet or 3 feet above high water level. Core borings to depths of 60 to 100 ft. showed soft, silty clay extending to a depth of approximately 85 ft., with a moisture content of 63% to 86%. Five methods of construction were considered—plain embankment; controlling rate of embankment placement and constructing fills along the toes to prevent excessive lateral displacement of the mud; incorporating sand



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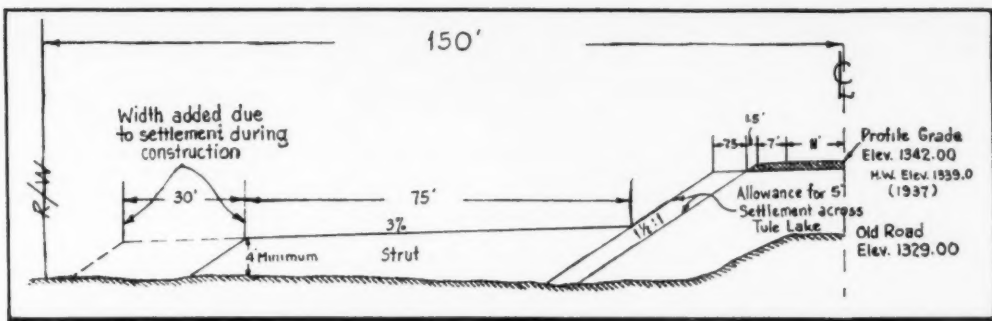
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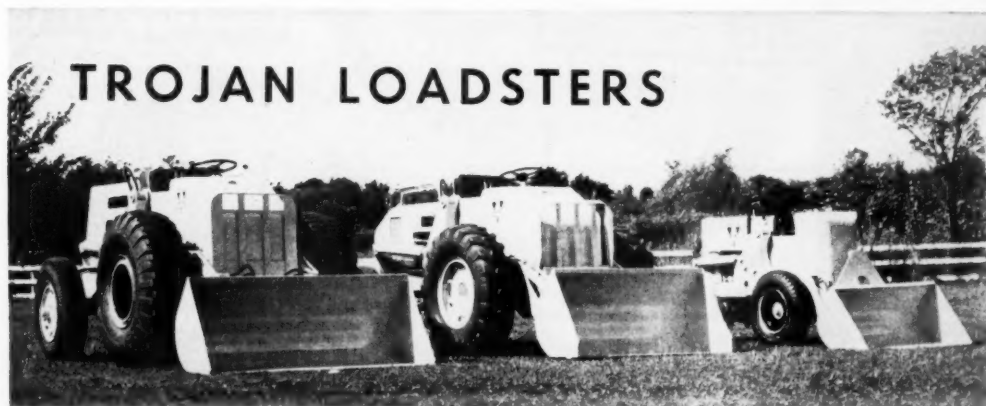
● **HOW California Highway Department built a fill on 85 ft. of mud.**

drains to a depth of 50 ft., with or without counterweight strut fills (very expensive); sand drain treatment for the full depth of the mud with counterweight fills. It was concluded that minimum ultimate cost of construction and maintenance would result from embankment without sand drains but with counterweight fills and controlled rate of placement. The road would probably settle and it would be necessary to raise it at intervals of perhaps five years to keep it above high water. The drainage structures

would be placed on a blanket of gravel. To permit keeping track of the settlement, 4 x 4 ft. timber platforms with vertical pipe indicators were placed on the old fill at several points and iron pins were driven into the ground at 50 ft. intervals out to 250 ft. from the centerline and elevations of these were taken daily. The counterweight fills were carried for 75 ft. width with a minimum depth of 4 ft. on each side of the road. These were placed first and opened for traffic while the embankment was being placed. The

rate of fill placement was limited to 8 inches lift in any one 24-hour period. The road constructed on the embankment (in November) consisted of 9 in. of imported base, 6 in. of road-mixed cement (2%) and soil and 1/2 in. of road-mixed surfacing, followed with 2 1/2 in. surfacing the following June.

That there was plastic flow of the soil during placement of the embankment was demonstrated by heaving at one point 150 ft. from the center line (beyond the counterweight) accompanied by rapid set-



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tlement of the embankment opposite this heave; also by the lateral movement of the newly constructed property fence and cracks which appeared in the counterweight fill. The settling platforms indicated that the mud subsided at a uniform rate, except at the one point referred to above, where there was a subsidence of 1.3 ft. in two days. During the first seven months after completion of the embankment it subsided a maximum of 2.3 ft. The maximum subsidence during construction was 4.3 ft., giving a total maximum of 6.6 ft. during the 12 months following the beginning of the embankment.

The above is condensed from an article by Percy A. Main, Assistant Highway Engineer, in *California Highways and Public Works*.

Designing and Constructing for Erosion Control

The Committee on Surface Drainage of Highways of the Highway Research Board considers control of roadside erosion to be of great importance, and to depend on both intelligent designing and careful

construction. It especially itemizes the following factors in designing:

(1) Cut and fill slopes should be as flat as is economically possible. (In considering economy, include cost of erosion control. As slopes become steeper, there is a rapid increase in erosion-control cost and a rapid decrease in effectiveness and performance of control.

(2) Rounding of slope intersections with natural ground; and transition grading (streamlining) between cut and fill.

(3) Drainage channels designed for need, not by a standard template.

(4) Culverts should be located with regard to erosion dangers; drop structures to prevent ditch erosion; aprons at outlets to minimize scour.

(5) Intercepting ditches for minor drainage from above the highway; flumes and special ditch design for handling farm terrace water; diversion channels from culvert outlets to natural drainage.

(6) Gutter paving should be included in original design and construction where conditions indicate that vegetation will not suffice.

(7) Berms and spillways on large fills and inside of elevated curves.

In construction, the following factors are important:

(1) Get the slopes built as designed. (A slope designed as 2:1, but warped during construction with the upper part 3:1 and the lower part 1:1, is neither good engineering nor good erosion control).

(2) Salvaging of topsoil from within construction limits will aid in subsequent erosion-control operations.

(3) Ground surface should be left in roughened condition. A rough slope surface saves expensive hand dressing, collects litter and wind-blown seed, and allows for water infiltration. (A slope should be uniform in shape, but the surface left rough. An attitude that an uneven bumpy slope can be remedied during roadside seeding operations leads to delay and added cost in erosion control).

(4) Speed in establishing vegetation is a prime factor in effective erosion control at low cost. Often expensive seedbed preparation is avoided by following immediately after construction. Often those "first rain" washouts are prevented. Provision for finishing the grading on a project, slope by slope,

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and following with erosion-control measures slope by slope is much more satisfactory than rough grading over an entire project with erosion control delayed for months. The finished product may be the same in both cases, but many yards of soil have washed away and many costly repairs are usually needed before completion under the delayed control method.

Brush Chopping

(Continued from page 84)

outfit for town use over a working period of 52½ days of actual operation during two seasons, at an average daily cost of \$114.12 for the two machines, pickup truck and two operators. This amount is arrived at by using a fixed rental rate for each machine, plus a fixed hourly charge for supplies, plus the operators' wages, for an average working day. The cost of additional labor supplied by the towns averaged \$25 per day.

When costs per unit of work accomplished are considered, however, no figures of any real value can be derived. For what they may be worth, the following figures show the work we have done and the costs. We have operated this unit over 149.4 miles of road in a period of 52½ days, or an average of 2.84 miles of road per day. The cost per mile of road averages \$40.10—with a high cost of \$80.10 and a low of \$21.13. Because of varying amounts and types of growth along any given mile of road, this figure means very little, so any further figure will relate to a mile of swath cut, in most cases this being a full 6-foot swath.

During this same period of 52½ days, we cut 180.5 miles of swath, or an average of 3.44 miles per day. The average cost per mile of swath was \$33.19. This cost was for the county unit only, and labor furnished by the towns would add \$7.27 to this figure, for a total of \$40.46 per mile of swath. Again, average figures such as these have little significance but as they are the only thing we have for comparison, they must be taken. Bear in mind, however, that the low cost for the county unit was \$19.16 and the high cost of \$66.28 per mile of swath, as compared to the average of \$33.19, and you can readily see that there is too much divergence between these figures to furnish any real basis for estimating costs.

This variation in cost is readily

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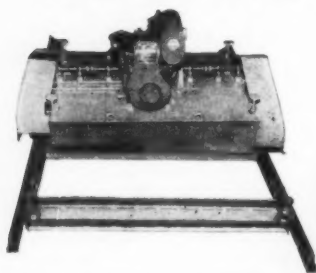
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accounted for by two factors over which the operators of the unit have no control—first, the type of growth to be cut and, second, the efficiency of the supervision and labor supplied by the towns. Most of our cutting has been done over roads which were badly overgrown, and which had considerable large growth to be removed. The low cost on some of this work is obviously accounted for by the fact that this cutting was done on roads where the growth was not large and where the cutting was over reasonably smooth roadsides. Re-cutting of sprout growth in subsequent years after initial cutting should be done at a substantial saving over the average cost shown above. In fact, we would expect the average cost for this type of work to be near the low cost shown above, if the operation is performed efficiently. Of course, heavy cutting must be done if necessary, but by efficient supervision, some economies can be introduced in heavy cutting by judicious use of hand labor. To some extent, therefore, the second factor is the critical one in calculating the costs of operation. There is no doubt that most efficient use of this unit would be reached by having experienced labor furnished by the county to perform the whole operation, but we find this impossible because of the shortage of labor and the difficulty of transportation, to name only two of several reasons.

We have used this machine during the past summer to cut weeds and grass—and a little brush—along our county road system. We have been able to do approximately 50% of the work along our road slopes and banks which conventional mowers could not reach, and which had previously been done by hand labor. Figures for this work are not available at the present time, but we believe the actual cost in dollars and cents is about the same as hand cutting for this type of work. We do feel that there is a saving during a period of labor shortage in doing everything possible by machine, thereby freeing patrol gangs for other necessary work which cannot be done except by hand labor.

But for the cutting of brush, and, after all, that is what the machine is designed for, we are sure there is a real economy. At present day labor costs, we do not believe that hand labor can cut and dispose of a strip of brush 6 feet wide and a mile long at a cost of \$40.46.

PUBLIC
WORKS

DIGESTS

THE SEWERAGE AND REFUSE DIGEST

Sewage Laboratories

In general, it is an advantage if the shape of the room permits placing benches against the four walls with another in the center and ample space for free movement between benches. If cupboards are placed under the benches, it is well to make them shallow, with their doors about 12 in. back from the front of the bench; this provides knee room for those sitting at the bench, and the open doors do not block the passage way. Reagents in frequent use can well be stored on open shelves for easy access, and near where they will be used most frequently. Among safety precautions, antidotes for use if a reagent is sucked into the mouth should be available readily for immediate use. Walls and benches should be light colored.

For O.A. and B.O.D. determinations, the preparation bench should be near an incubator, which should be near the titration bench, which should have a sink adjacent to it. For nesslering and comparator work, adequate bench space with a north light is necessary. For ammonia and nitrogen determinations, the stands for flasks and condensers should be next to a sink and near the fume hood. The Gooch crucible method requires vacuum pumps near a sink. The ovens should be near the balance room.

Richard Wood—"General Laboratory Layout on Medium-Sized Sewage Works", *The Surveyor*, Feb. 2.

Refuse Collection in Santa Ana, Calif.

Trash and garbage are collected from dwellings and business properties in Santa Ana without special charges. The net cost is paid from city taxes, of which \$0.30 per \$100 is allotted for this purpose. Collection is made from about 14,500 stores and houses. The garbage is sold to a

hog grower and the trash to a contractor, who operates the dump and sells the paper, clothing and other salable material, and pays the city \$420 a year for it, delivered at the dump. The garbage contractor pays for garbage delivered to his trailer, the price depending on hog prices; at present he pays \$2.52 a ton, or about \$10,000 a year. The cost to the city of collecting and delivering garbage and rubbish is about \$153,000 a year. The contractor gets about \$18 a ton for cardboard, \$11 for lightweight paper, 1¢ a pound for rags. (The Salvation Army and Goodwill Industries get most of the clothing and shoes from the citizens). He uses at the dump 3 bulldozers, a press and baler for rags and paper, 2 hay balers for cardboard, a sprayer outfit to extinguish fires and wet the cardboard, and 7 men. The city uses 5 "Load Packers" and 10 open trucks, with 35 men, in collecting garbage and rubbish.

Paul W. Travis—"Free Trash and Garbage Disposal," *PUBLIC WORKS*, March.

Disposal of Oil Emulsions

The Cadillac Motor Car Div. of General Motors Corp. operates a plant at Cleveland, O. from which it discharges a 250,000 gpd effluent high in oil emulsions which will not break easily. This it is required to treat so that the effluent contains no visible oil or free acid. The wastes go to two storage tanks, from which they are pumped to a mixing tank where ferric sulphate and sulphuric acid are applied, and the liquid is settled and drawn off to two separators, where the oil is skimmed off and flows to storage tanks for sale. The sludge is dried on beds, the drainage from which is returned for retreatment. The effluent, from which most of the oil has been removed is pumped through pressure sand filters, the effluent from which is aerated and chlorinated.

"Tough Industrial Disposal Problem Solved at Renovated Army Tank Plant," *Engineering News-Record*, March 6.

Floc-Producing Bacteria in Activated Sludge

Butterfield in 1935 reported that he had isolated an organism, *Zooglea ramigera*, which formed a floc similar to activated sludge. This was confirmed by several others. The rapid ability of this organism to stabilize nutrient substrates has caused it to be accepted as the primary organism in activated sludge. The author's investigation resulted in the isolation of 11 other organisms capable of forming a similar floc when aerated in a suitable nutrient substrate. These included *Escherichia intermedium*, *Paracolobactrum aerogenoides*, *Nocardia actinomorphia*, *Bacillus cereus*, a bacterium belonging to the genus *Flavobacterium*, and *Aerobacter aerogenes*. These organisms give good BOD removals, but nothing has been shown as to their relative importance in the normal activated sludge process.

Ross E. McKinney and Murray P. Horwood—"Fundamental Approach to the Activated Sludge Process," *Sewage and Industrial Wastes*, February.

Controlling Psychoda Flies at Akron, Ohio

Between 1929 and 1947 filter flies at the Akron plant were such a nuisance as to cause damage suits against the city totaling \$130,000 by January 1951. During 1947 to 1950 inclusive the city spent \$21,348 for insecticide and major equipment used in a comprehensive test of all promising methods and materials for controlling the flies. The construction of the beds did not permit flooding, but they believed that chemical applications were preferable for several reasons: Handling

the sewage flow while the bed was held full; low efficiency of a filter for a few days after flooding; necessity of frequent flooding; and the kill is not as great as with chemicals. Various chemicals have been tried, and combinations of them; and different methods of applying them, including introducing them into the sewage that is to be distributed on the bed; with a fog applicator; with a contact or surface sprayer, using a farm-type spraying outfit. The insecticides used were D.D.T., Chlordane, Lethane 384, Pyrenone, Benzene hexachloride,

and Nifos T. In 1948 a biologist was employed to study the problem.

The conclusion from these years of experiments was that Benzene hexachloride with 11% gamma isomer appears to be a relatively positive insecticide and larvicide for control of the *Psychoda* flies, very effective at the rate of 4.5 gal. per acre. It should be applied very early in the season at double the normal rates. Although more expensive per gallon than any other insecticide used at Akron, it was the most economical because of the longer period of effectiveness be-

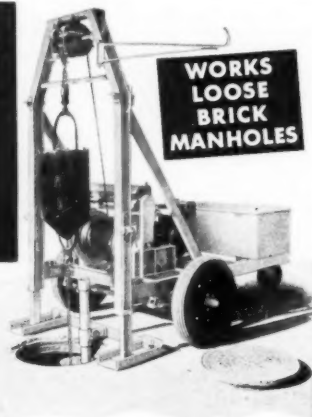
tween dosages. A 2-hr. resting period after a dosage seems to be ample time for complete contact. A wet application with sufficient pressure to force the solution a little below the immediate surface increases its efficiency. The insecticides used did not appear to affect the filter efficiency. It may be found desirable to rotate insecticides to overcome the tendency of the filter fly to become immune to a specific insecticide.

T. C. Schaetzle—"Control of *Psychoda* Flies at Akron;" *Sewage and Industrial Wastes*, February.

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Detergents in Baltimore's Sewage

The detergent content of the raw and treated sewage at Baltimore's Back River treatment plant, as determined from samples taken hourly during a 5-day period, averaged 1.5 ppm of sulfonated surface compounds in the raw sewage. The average was 15% less in the primary tank effluent; 27% less in the trickling filters; 39% less in the humus tank effluent; 38% less in the aeration tank effluent; and 21% less in the activated sludge settling tank effluent. The amount of detergents was so small that errors in sampling and analyzing have a proportionally great effect on the results obtained. They apparently have no detrimental effect on the treatment processes. They do, however, seem to cause an enormous amount of foaming in the aeration tanks.

C. E. Keefer—"Detergents in Sewage—Baltimore's Experience;" *Water & Sewage Works*, February.

Standards for Effluent Quality

The significance and usefulness of suspended solids as a basis for standards has not been disputed, but the same cannot be said of the B.O.D. test. There are good reasons for doubting whether this test always gives a true indication of the effect of an effluent on the river to which it is discharged. Also it is well known that the test is prone to give "abnormal" results. For example, a partially nitrified effluent may give very high results, which may or may not be truly indicative of the effect of the effluent on the stream. A well nitrified filter effluent and an un-nitrified activated sludge effluent, produced on the same works, may both give low

B.O.D. figures; but when mixed may give a high result—much higher than for either of the individual effluents. In such a case, if the two effluents were discharged separately to the stream, from carriers side by side, each would satisfy the standard based on B.O.D. But if they were mixed and discharged from a single carrier, the effluent would fail to satisfy the standard. Yet obviously the effect on the stream would be the same in each case. Such considerations shake one's faith in the B.O.D. test as a standard. F. W. Roberts, in a paper, presented at a meeting of the Metropolitan and Southern Branch of the Institute of Sewage Purification on December 13th, gave the opinion that in cases of low dilution a high dissolved oxygen concentration in the effluent discharged is as important as a low five-day B.O.D. There is much to be said for this view; fish cannot live without oxygen, but they do not carry out five-day B.O.D. tests. It must be admitted, however, that it is much easier to expose the defects of the B.O.D. test than to find a better substitute.

"Sewerage and Sewage Disposal in 1951," *The Surveyor*, Feb. 16.

Ventilation of Trickling Filters

Is forced ventilation desirable for supplying the air or oxygen required to maintain aerobic conditions in a trickling filter, or is the operation of natural conditions sufficient? In seeking the answer to this question the author made elaborate measurements at four different plants in Minnesota, three of them covered and the fourth uncovered.

He used dry-bulb and wet-bulb thermometers, aneroid-type barometer recording to 0.01 in. of mercury; a sling psychrometer; hot-wire anemometer; deflecting-vane velocity meter; and differential manometer. Assuming oxygen content of air to be 23%, and that only 5% of that passing through the bed is assimilated, the author calculates that the air flow through a filter should be at least 0.1 cu. ft. per min. per sq. ft. Natural ventilation was found to be sufficient to supply such air flows. Such ventilation is caused by differences in air densities between the air inside and that outside the filter, and by wind forces. It appeared that a temperature differential of about 2° F is necessary to cause this rate of air flow (0.1 cu. ft. per min. per sq. ft.). To allow

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for effect of humidity and contingent factors, he assumes a temperature difference of 5°. It was found that wind velocities over 2.0 mph were significant in causing ventilation. Study of U. S. Weather Bureau records for Minnesota and recorded sewage temperatures showed only a few days of the year when the temperature difference was less than 5°, and on none of those days was the wind velocity less than 5.4 mph. However, the geographical location of a filter and local conditions may limit the ventilation; and the length of time a filter may operate without sufficient ventilation is not known.

Walter K. Johnson—"Ventilation of Trickling Filters," *Sewage and Industrial Wastes*, February.

Phenol Destruction By Activated Sludge

On October 27, 1950, an experiment was started by the Gary, Ind., Sanitary Dist. to determine to what extent ammonia wastes could be treated and phenol destroyed effectively by the activated sludge process. When the Gary plant was asked to receive, for treatment, wastes containing 500,000 gpd of

ammonia still liquor, containing 1,500 to 2,000 lb. of phenol, and considered that the courts forbid discharge into the lake of any appreciable amounts of phenol, it decided to conduct experiments to endeavor to learn whether ammonia wastes could be treated effectively, and the efficiency with which phenol could be destroyed; the effect of the variable factors in the ammonia wastes on the treatment process and on gas production. From experiments (described in detail in the article) conducted during 1950-51 it was concluded that ammonia wastes containing up to 123 ppm of phenol, in terms of sewage flow, can be treated successfully by the activated sludge process at Gary; and that the anaerobic process is inhibited by the waste that is pumped to the digesters with the raw sludge, resulting in a decrease in gas production. Phenol in the ammonia still waste, in terms of sewage flow, could be treated in concentrations up to 25 ppm and with approximately 100% effectiveness, provided there was no excessive build-up in concentration of some other toxic substance that might inhibit the aerobic process. Solids concentra-

tion in the mixed liquor must be increased to take care of the increased load. Extra air must be supplied because of the additional organic load imposed on the treatment process. A higher rate of sludge return is required if the air requirements are to be kept to a minimum. Complete destruction of phenol cannot be effected if the aeration period be greatly reduced.

W. W. Mathews—"Treatment of Ammonia Still Wastes by the Activated Sludge Process," *Sewage and Industrial Wastes*, February.

Vitamin B₁₂ From Activated Sludge


Vitamin B₁₂, first isolated in 1948, has been found effective in various anemias, and so improves the utilization of vegetable protein by chickens and swine as to produce up to 20% greater weight increase per pound of food consumed. Analyses of heat-dried activated sludges as sold by Milwaukee, Chicago and Houston revealed the presence in them of Vitamin B₁₂ in amounts varying from 4.5 to 0.17 mg/g. There is a 60 to 75% loss of the vitamin in drying sludge as now

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practiced, and possibly this loss can be reduced by use of other drying methods. Apparently no toxicity results from the incorporation of dried sludge in diet of chicks.

Sam R. Hoover et al—"Activated Sludges as a Source of Vitamin B₁₂ for Animal Feeds;" *Sewage and Industrial Wastes*, January.

Disposal of Waste Pickle Liquor

Neutralization of waste pickle liquor with the cheapest available alkali is the most extensively used method of disposal, as being the cheapest yet developed. Even by this method, disposal of a ton of equivalent acid costs at least as much as did the purchase of the original ton. Lime is commonly used as the neutralizing agent; many alternatives have been tried, but none have proved generally acceptable. After mixing with lime, a sludge settles out, the disposal of which constitutes a serious problem. Any possible product recoverable is almost certain to be of low value, and the amounts would be so large as to reduce still lower the sales value, and the sludge is generally discarded into lagoons, where it dries very slowly and large lagoon areas are required. However, Walker of Conshohocken dewatered its sludge on a vacuum filter to 46% solids content; which dewatered sludge dries a little faster than wet clay and makes a stable fill material.

Thomas F. Reed, W. A. Cubberley and C. J. Lewis—"Waste Pickle Liquor Treatment and Disposal;" *Sewage and Industrial Wastes*, January.

Biological Studies Of Stream Pollution

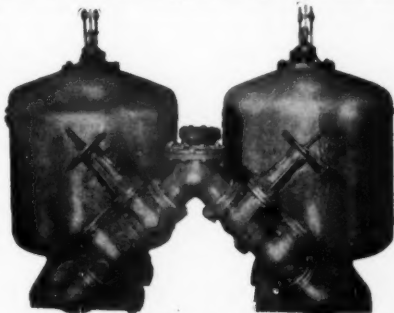
In making biological studies of stream pollution, there seems to be general agreement that the existence of water fungi, such as *Sphaerotilus*, is an indication of progressive degradation of the stream; that rat-tail maggots and sludge worms indicate near or absolute septic conditions; and that the presence of blood worms, if below a septic zone, is indication of the beginnings, at least, of recovery. Some place more reliance on the microscopic plants; others on the plankton organisms, especially the animal variety. The author considers animal and fungus forms more reliable than the green plants; particularly valuable are the sewage

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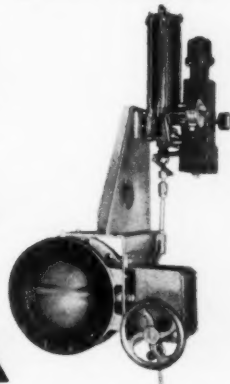
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fungi, insect larvae, animal plankton, and larger forms such as snails, clams and fish. The use of these forms as pollution indicators has an advantage over and above the fact that they are the most reliable. Their collection and identification does not require a large staff of experts. Laboratory studies of biological indices of stream pollution are of particular help in problems relating to the toxic properties of industrial wastes rather than to their oxygen depleting capacity.

Willis M. Van Horn—"Using Biology as a Tool in Stream Pollution Work," *Wastes Engineering*, February.

Paints for Sewage Plants

Paints that are satisfactory for general use may not be suitable for many locations in a sewage treatment plant. There are, however, many paints and painting systems which are very satisfactory for use around such plants. The writer describes at great length the materials and methods developed by the Chicago Sanitary District for protecting metal structures. He discusses

sand blasting, flame cleaning, phosphoric acid coating and other surface preparations. The prime coat determines to a large extent the efficiency of the entire paint job. The top coat serves to protect the prime, or decorate the surface, or both. The prime coat must be impervious to moisture, acids and gases; must not soften appreciably when covered by accumulations of oils, greases and soaps, or be easily damaged by abrasion of floating matters. It must both bond well to the steel and provide a good bond for the top coats. These qualities are largely afforded by the vehicle. The vehicle found most serviceable under these conditions is a 25-gal. para-phenyl-phenol-tung oil varnish. The addition of a pigment increases the density. The greatest usable density is obtained by a pigment volume of 30 to 35%. A moderate amount of mica, especially graphitic mica, adds considerably to the life and usefulness of a metal priming paint. A most important function of the prime coat is to inhibit corrosion of the steel when the corroding liquids eventually get through the paint film to the steel, as they inevitably do. Except for

painting new galvanized surfaces (for which zinc dust-zinc oxide paints are better), red lead primer outlasts most other paints, even in submerged locations, if properly covered by suitable top coats to protect it.

For top coats, bituminous materials are supplied as either a hot coat material, a cutback paint, an asphaltic varnish or a water emulsion. A coat of coal tar or asphalt uniformly applied without pinholes or flaws, which does not alligator, crack or flow, would provide about the best protection that could be found for under-sewage work. But unfortunately these ideals are not usually attainable. They furnish no inhibition of corrosion. They should be quite thick and applied as a solid continuous film. Asphaltic varnishes, when dry, are quite waterproof but are sensitive to oils, greases and soaps. Emulsions are quite water- and gas-tight when dried in thick coatings. Cutbacks afford by far the poorest protection of any of the bituminous coatings.

W. T. McClenahan—"Paint Protection of Sewage Works Structures," *Sewage and Industrial Wastes*, January.

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Tachometers Check on City Trucks

Some months ago it was announced that the Milwaukee, Wisc., Department of Public Works had decided to install a tachometer on a garbage truck. This device was designed to record the time when the truck was idle and when it was collecting garbage. Nothing further was said about the installation of the tachometer, but it now appears that the department installed the devices on a number of garbage trucks. In September tachographs were furnished to officials of the Department of Public Works. As a result, a number of garbage crew supervisors were suspended, as the tachographs on trucks used by such supervisors' crew were idle too great a time during working days. The re-

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cording device, which works only when the truck wheels are turning on the job, showed that a full 8-hour day was not being put in in many instances by the garbage collecting crews. Some days the work periods was as short as 6 hours and 50 minutes.

The tachometers show the rate of speed of the truck, distance traveled per day, when the trucks stopped and when the motor is turned off. Now that the men know about the devices, they call them mechanical spies.

Bituminous Sludge for Road Surfacing

In 1949 and 1950, two experimental surfacings were laid on Swedish airfields where jet-aircraft were in service. Both airfields, which were originally surfaced with stone-filled asphalt, were surface-treated with a bituminous sludge made up of fine sand, limestone filler, tar and water. The sludge was spread in layers, on the first site by hand, and on the second by a tank-spreader. The sludge is said to have filled in irregularities and cracks in the original surfacing in a satisfactory manner and to have stood up to heavy service without developing any

major faults. Further, this type of surface-treatment is cheap, if the process is adequately mechanized. However, the method as practised in Sweden cannot yet be said to be out of the experimental stage. This summary is from Road Abstracts.

Alum in Sludge Drying at Corpus Christi

The Broadway sewage treatment plant at Corpus Christi, Tex., receives 8,000,000 gpd and is grossly overloaded. One result of this was fly breeding in the sludge drying beds. Efforts to prevent this by application of various chemicals to the sludge beds proved ineffective. But remarkable results were obtained by applying alum to the wet sludge as it flowed onto the beds. An alum solution, 200 lbs. dissolved in 50 gals. of water, was applied at the rate of 1 lb. of alum to approximately 100 gals. of sludge or, roughly, 2 lbs. to 1 cu. yd. of sludge.

"The sludge depth in the drying beds dropped from 8½ ins. to 4 ins. in the first 24 hrs., and the sludge surface developed a fairly dry crust. It was interesting to note that the adjoining beds dropped less than 1 in. after standing five days.

Thus, alum cut the sludge drying period approximately in half and resulted in additional sludge drying capacity for the overloaded sewage plant.

"It permitted more rapid removal of the fly breeding media and, since it dried quite rapidly, it was less attractive to flies. Economically it was quite a saving also, since alum is cheap, thereby reducing the chemical and labor costs in an effort to keep flies under satisfactory control."

Texas Health Bulletin, as quoted in Sewage and Industrial Waste.

New Jersey Civil Defense

(Continued from page 75)

ingestion of contaminated water or food products should not be permitted.

Biological and Chemical Agents

There have been many divergent views expressed on the subject of biological warfare. Statements have been made that biological warfare is an absolute weapon capable of disabling or destroying the entire population of large cities, either di-

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rectly or by the initiation of self-perpetuating disease epidemics. Other statements have insisted that it is not even a practical weapon and that it presents no dangers. The truth about biological warfare lies between these extremes.

In addition to biological and atomic warfare, the possibility also exists of the contamination of water supplies by chemical warfare agents. The materials which need to be considered as possible sources of pollution of water are (1) arsenical compounds, (2) heavy metals, (3) cyanides, cresols and phenols, (4) glucosides and alkaloids, and (5) war gases.

The contamination of large supplies of water, such as city reservoirs with war gases is not very likely, since enormous amounts of these gases would be required to make the water unsafe to drink. The most effective of the war gases are the vesicants or blister gases and the newer nerve gases, about which there is little published data. It has been estimated that in order to contaminate a 189 million gallon reservoir 79,000 pounds of mustard gas or 36,000 pounds of lewisite would be required. The possibility of the use of war gases does, however, exist as does the subversive use of the other aforementioned chemical contaminants.

The willful contamination of water by sabotage or by direct enemy action is a possibility. Chemical poisons, bacteria or their toxins, viruses, and radioactive materials could be introduced either into reservoirs or the distribution system.

Proper operation and control of a water supply requires that certain chemical and bacteriological examinations of the water be made. These include the examination of the raw and treated water at such intervals as the character and the treatment of the water may indicate, and of the routine collection of samples from representative points in the distribution system. The present water sampling station program of the State Department of Health, in cooperation with local health and water works officials, will be continued and intensified to provide under present conditions more adequate data as to the quality of the water throughout the distribution system at all times. The technical manual for water and sewage discusses the recommended tests and their interpretation.

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of contamination in water certain tests are necessary. Some of these are regularly carried on in water works laboratories; others are not. Certain of these tests or examinations are not specific but do show that contaminants are present. They are readily performed and permit the initiation of corrective measures immediately and prior to ascertaining the exact cause of the trouble. Definite information as to the exact nature of the trouble is, of course, desirable and should be obtained. In general, however, action must be taken prior to the determination of the exact cause. As a routine, therefore, the more specific tests are not considered necessary.

**Laboratory Examination
of Water**

In the technical manual, New Jersey is recommending that the following tests be performed on all samples on a routine basis: (1) coliform organisms and total bacteria, (2) pH, (3) taste, odor, color and turbidity, (4) nitrates, chlorides, and sulfates, (5) chlorine demand, (6) oxygen consumed, and (7) cyanides, and alkaloids. This intensified sampling and testing program will be initiated at an early date to secure a background of data relative to water quality. This is important since these tests, with the exception of cyanides, and alkaloids, indicate pollution through a deviation from the norm.

The agar count for total bacteria provides a better general guide as to the presence, in water, of pathogens incidental to biological warfare than does the coliform index. The reason for this is that any biological warfare or sabotage with pathogenic organisms would not be accompanied by fecal pollution introducing coliform organisms. The agar count, however, and other methods of water bacteriology will not be indicative of the presence or absence of viruses.

Public Health Reports, Volume 66, Number 30, July 27, 1951, describes "The Membrane Filter in Sanitary Bacteriology." M. D. Hollis, Assistant Surgeon General, U. S. Public Health Service had the following to say about the membrane filter:

"A major problem of bacteriology has been the development of rapid, accurate techniques of isolating, identifying and counting organisms in water, air, and food. The authors of this paper have undertaken what is probably the first systematic

series of controlled experiments in the United States to develop and apply techniques employing a membrane filter for this purpose with water. The results reported promise a substantial reduction in the time, labor, and space required for specified phases of bacteriological analysis and, at the same time, they indicate a likelihood that these techniques will be more certain and precise in results than methods now in use. These experiments have a particular significance for the hygienic aspects of water work operations. They also imply economies and technical advantages such as ease of transportation, which would permit bacteriologists to extend their services to small water plants and to rural areas."

The filter is not commercially available at the present time. However, the results, as described in the aforementioned publication, warrant consideration by people concerned with the sanitary quality of our water supplies.

The United States Public Health Service has suggested limiting concentration of radioactivity for water to be used for short periods of time, ten or thirty days, following an atomic disaster. These emergency levels of activity can be detected with portable monitoring instruments. A more exact analysis will require the use of a laboratory scaler counter. The State Department of Health of the State of New Jersey has such a unit for use in a program for the radiological examination of the waters of this State in conjunction with its stream pollution program. This equipment will be available for any possible Civil Defense Application.

Any emergency that may occur will be a serious challenge to our public health activities. The intense preparation and planning for such an emergency will have a long range value in terms of permanent public health progress since the best preparation to deal with an emergency is the strengthening of our routine public health programs.

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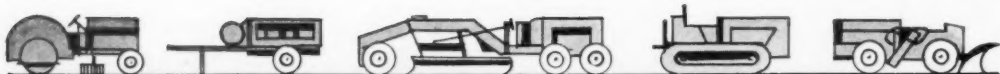
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Public Works

EQUIPMENT NEWS

Camel-Back Boom for all Wayne Crane Excavators

A new heavy-duty camel-back boom has been designed for use



New Wayne Trenchhoe.

with all models of Wayne crane excavators. This boom increases the reach, for instance, of the $\frac{1}{2}$ -yd. crawler, Model 66, to 26 ft. 3 ins. at grade level and allows a digging depth of 17 ft. 3 ins. Also, it permits the operator to make a clean-cut vertical backwall to maximum depth; and it gives a greater dumping height for the spoil. Full data from Wayne Crane Division, American Steel Dredge Co., Inc., Fort Wayne, Ind., or by using the coupon.

Use coupon on page 36; circle No. 4-1

Rubber Tired Roller Has Total Weight of 200 Tons

Designed and built for testing fills on air base runways where heavy planes are to operate, this rubber tired roller weighs 77,000 lbs. empty and is provided with cast iron ballast blocks. The maximum weight is 400,000 pounds. There are 4 tires, 3000 x 33; the roller is in halves designed to oscillate independently. Data from Shovel Supply Co., Dallas, Texas, or by using the coupon.

Use coupon on page 36; circle No. 4-2

Automatic Program Control for Chlorination

This device controls the feed of chlorine at predetermined rates for predetermined periods in identical cycles to meet variations in chlorine demand. Operation is pneumatic or water; control is positive and accurate. All major elements are contained in a dust-proof case for wall or floor mounting. Full data from Builders-Providence, Inc., 345 Harris Ave., Providence 1, Rhode Island, or use the coupon.

Use coupon on page 36; circle No. 4-3

"Screw-Seal" Joint and Ceramic Pipe for Special Jobs

This joint development combines plastic with vitrified clay to form a



Screw joint ceramic pipe.

leak-proof and infiltration-proof joint. The industrial clay pipe is made with a threaded joint of Plastisol, which is a vinyl resin, resistant to most corrosive acids and noxious gases. The joint is available in 4-in., 6-in. and 8-inch internal diameter pipe. An excellent folder is available describing this, how it works, and showing available fittings and their dimensions. Write Robinson Clay Product Co., Akron 9, Ohio, or use the coupon for full information.

Use coupon on page 36; circle No. 4-4

Catalytic Apparatus for Hydrocarbon Treatment

What the above means is that here is a unit, which can be installed in a few minutes on your truck, tractor or engine. It is claimed to eliminate deposits of gums and sludges in the lubricating system and to improve lubrication. Action is catalytic. It also can be placed in the fuel feed line. Write A. B. Hydrocarbon Systems, 2808 McKinney Ave., Dallas Tex., asking about Solatone, or use the coupon.

Use coupon on page 36; circle No. 4-5

Snow Blower Works with Caterpillar Motor Grader

Here is something to help in that tough job of snow removal. It is a propeller type blower that works with a snow wing on a Caterpillar No. 12 or 112 motor grader. The 48-inch fan is driven by a power takeoff at 500 rpm, and the drive is the same as that used for the Domor elevating grader and it can be used interchangeably. The blower is controlled from the grader cab. Snow is cast well off the right of way, making subsequent control

easier. Full data from Ulrich Products Co., Roanoke, Ill., or use the coupon.

Use coupon on page 36; circle No. 4-6



Snow blower on motor grader.

Propane-Butane Fueled International Motor Trucks

Liquefied - petroleum - gas - powered engines are now available



L P G powered International.

for International trucks, and these engines are optional on all models equipped with the heavy-duty Super Red Diamond engines. This L-P fuel (propane-butane) is now widely available and cheaper than regular gasoline. On these L-P equipped models, standard gasoline tanks have been replaced with 62-gal. tanks which are filled to about 90% capacity. For fuller data, write International Harvester Co., 180 N. Michigan Ave., Chicago 1, Ill., or use the coupon.

Use coupon on page 36; circle No. 4 - 7

Small Scraper for Use with Wheel Tractor

Among the unique features of this small scraper are its ability to backfill, scarify, grade (both rough and finish) and do other allied types of dirt-handling work. Bucket is $\frac{3}{4}$ -yd.; cutting and backfilling blade is 66 ins.; total weight is 450 lbs. Controls are hydraulic, including the scraping angle control. Tilt of the blade can be changed immediately for scraping, backfilling or scarifying. Ask about the McGee

scraper from Tractor Sales Corp., 1409 Santa Fe Ave., Los Angeles 21, Calif., or use the coupon.

Use coupon on page 36; circle No. 4 - 8



Fine for light work.

A Device for Cleaning Equipment Quickly

The illustration herewith shows a Malsbary cleaner blasting encrusted



Cleans equipment quickly.

dirt and salt from a shovel loader owned and operated by the City of Boston, Mass. The cleaner is mounted on a trailer so that it is easily moved from one equipment yard to another. Daniel J. Coughlin, Sup't. of Automotive Equipment, says this cleaner enables him to clean sanding trucks in one hour, shovel loaders in 45 minutes and street sweepers in two hours. More from Malsbary Mfg. Co., 845 92nd Ave., Oakland, Calif., or by using the coupon.

Use coupon on page 36; circle No. 4 - 9

Special Mobile Truck Units for Civil Defense

Two specially equipped mobile truck units have been made available to Philadelphia's civil defense program by Henry Disston & Sons, of that city. These units are practically machine shops on wheels. Each carries a loud speaker system, generator, air compressor, drill press, arbor press, acetylene torch equipment, saws, axes and other tools. The basic rescue tools are chain saws and portable gasoline driven tools to cut through heavy

timbers. More data from Henry Disston & Sons, Philadelphia, Pa., or use the coupon.

Use coupon on page 36; circle No. 4 - 10



The came, sawed and concurred.

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When you specify KONIK metal culvert sheets you can be sure you're getting extra years of trouble-free culvert service. KONIK stands the rigors of rough abuse—resists rust and corrosion—because it's a tougher culvert sheet. Copper, nickel and chromium make it tough and strong. That's what you need for a long culvert life. Insist on KONIK. Continental Steel Corporation, Kokomo, Indiana.

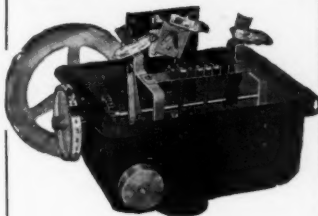
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PW-1

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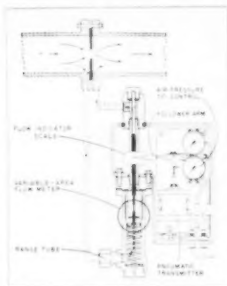
"The right product for every piping need" is shown on a wall chart just published by Dresser. It answers questions in regard to couplings, clamps, fittings and repair devices for pipe of every size and every kind. The chart is available in two sizes—22" by 34" and about half that size. For your copies, write Dresser Mfg. Div., Bradford, Pa.

Use coupon on page 36; circle No. 4 - 11



A New Approach to Orifice Metering

The V/A cell, instead of measuring the static-pressure differential across the orifice, meters a continuous by-pass stream around that orifice.



fice. A linear, rather than a square-root relationship, exists between the by-pass flow and the main flow, permitting a wide range of measurement and simple adjustment. Full data from Fischer & Porter Co., Hatboro, Pa., or by using the coupon.

Use coupon on page 36; circle No. 4 - 12

PUBLIC WORKS for April, 1952

USED EQUIPMENT AND CLASSIFIED ADS

NOTICE TO BIDDERS

Sealed bids will be received until 09:00 A.M. EST April 22nd A.D., 1952, by the City Commission in the City Commission Chambers at Fort Lauderdale, Florida, for "Ten Gravel Barrel Wells and pumping stations."

Bidding blanks may be obtained from the office of The Engineer. Plans and specifications are on file in the office of the Engineer. A deposit of \$25.00 for plans and specifications, and of \$25.00 each for additional copies of plans or specifications, will be required. All deposits for plans and specifications will be refunded upon their return in good condition within ten (10) days of the opening of bids.

A certified check for 2% of the total amount of the bid, made payable to City of Fort Lauderdale, Florida shall accompany each proposal as evidence of good faith and responsibility of the bidder. This check shall be retained by the payee as liquidated damages should the bidder refuse or fail to enter into a contract with the payee for the execution of the work embraced in the proposal, in the event the proposal of the bidder is accepted.

The Owner reserves the right to reject any or all bids.

City Manager
H. M. Link

NOTICE TO BIDDERS

Sealed bids will be received until 9:00 a.m. EST April 22nd A.D., 1952, by the City Commission in the City Commission Chambers at Fort Lauderdale, Florida, for "Laying 8", 10", 12", 16", 18", 20", 30", and 42" Raw Water Mains."

Bidding blanks may be obtained from the office of the Engineer. Plans and specifications are on file in the office of the Engineer.

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The Owner reserves the right to reject any or all bids.

City Manager
H. M. Link

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MEASURING
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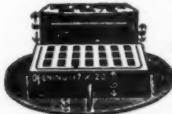
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Use coupon on page 36; circle No. 4 - 13

Automatic Stand-by Light Has Many Values

A rechargeable battery and a visible ball float hydrometer are features of this stand-by light for emergency uses. When plugged into a light socket, a built-in trickle charger maintains the battery between emergencies and a built-in fast charger restores it quickly for the next need. Many types of lamps are available. Write Carpenter Mfg. Co., Somerville, Mass., or use the coupon.

Use coupon on page 36; circle No. 4 - 14



Carpenter standby light.

Square Base Safety Traffic Cones of Rubber

Square base rubber traffic safety cones are now being produced. These are about 18 ins. high, weigh about 2.75 pounds each and have a 10½-inch square base. They are painted in bright colors—red, yellow, etc., for long range visibility; and luminescent cones can be provided for night safety. Write Safety Traffic Cones Corp., 949 N. Vignes, Los Angeles 12, Calif., or use the coupon.

Use coupon on page 36; circle No. 4 - 15



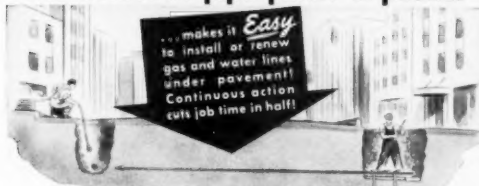
Traffic safety cone.

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These proportioning weir tanks consist of a specially constructed tank incorporating a stilling chamber, an accurately machined rectangular weir, two outlet chambers and a flow splitter. The arrangement is such that the total flow to the two outlets can be divided readily and the per cent of flow shown. For applications, write Omega Machine Co., 345 Harris Ave., Providence 1, R. I., or use the coupon.

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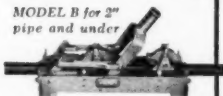
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This is announced as a completely new unit, available for any of the variations listed in the heading above. Weight is about 45,000



3/4-yd. shovel-dragline is track-mounted.

pounds. The boom is of light-weight alloy steel; a high-speed boom hoist with controlled lowering is standard equipment. Dipper trip is by electric push-button. A special type of track pad is provided. Basic design is the same as on the larger American units. Full data from American Hoist & Derrick Co., St. Paul 1, Minn., or by using the coupon.

Use coupon on page 36; circle No. 4 - 17

Emergency Fuel Unit and Engine Trouble Shooter

Installed on a carburetor (it takes one minute to install) this "Gas-o-lator" will locate the source of trouble at once. It is also starting insurance for vehicles against any fuel system breakdown. It will operate independently of the regular fuel system and get the vehicle moving under its own power immediately. For more information write Viking Tool & Mach. Corp., Belleville 9, N. J., or use the coupon below.

Use coupon on page 36; circle No. 4 - 18

Rust Preventive Paint Dries in 10 Minutes

This new formula is called "FD-425." It is especially effective in preventing corrosion from salt air, fumes, etc. One coat provides good protection and it dries in 10 minutes after application. Can be applied over damp surfaces or new or rusted metals. Available in several colors, which leave a semi-gloss finish and in aluminum. Further data from United Laboratories, Inc., Cleveland 12, O., or use the coupon.

Use coupon on page 36; circle No. 4 - 19

A Combined Form and Reinforcing Unit

Cofar is a prefabricated combined form and reinforcing unit which provides a one-stage operation system for placing positive reinforcement and for forming steel. It is especially designed for building work, including floors and ceilings, and has been approved by the Building Officials Conference, which amounts to approval by many or most cities. Ask for Report 51-10, Granco Steel Products Co., Granite City, Ill., or use the coupon.

Use coupon on page 36; circle No. 4 - 20

ASSOCIATIONS

The Fifth National Public Health Engineering Conference will be held at the Student Service Center, University of Florida, Gainesville, May 20 and 21. Waste problems of industry and their solutions constitute the theme of this year's meeting. These conferences have been highly valuable. For more information, write Dr. David B. Smith, Department of Civil Engineering, at the University.

The American Water Works Association will hold its annual meeting in Kansas City, Mo., May 4 to 9. The nominee for President for the forthcoming year is Charles H. Capen of New Jersey and the nominee for vice-president is Morrison B. Cunningham of Oklahoma City. Honorary memberships, medals and prizes, already announced by the Association, will be presented at the Kansas City meeting.

JOBS FOR ENGINEERS

Wanted: Sanitary Engineers for Overseas Work

The U. S. Public Health Service has a number of vacancies in the grades of sanitary engineer and senior sanitary engineer for duty in India, the Middle East, Indo-China and the Philippines. These involve environmental sanitation, water supply, malaria control and sewerage. Pay is for the grade in which appointed, plus a varying foreign service allowance depending on the country to which assigned. Also 2 vacancies for sanitarians. For more data write Sr. Sanitary Engineer A. E. Williamson, Division of International Health, Public Health Service, Washington 25, D. C.

The solution to YOUR sludge dewatering problems

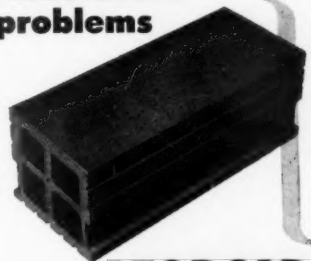
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★ **MARTIN E. GILWOOD** is new director of research, THE PERMUTIT COMPANY, New York.

★ **CARL W. TUOHEY** will now work with THE FRANK G. HOUGH COMPANY distributors in North Atlantic and New England states in selling "PAYLOADERS."

★ **BECKMAN INSTRUMENTS** Inc., manufacturers of pH control equipment, has bought 40 acres near Los Angeles to gather into one place operations now occupying 14 locations.

★ **AT KOEHRING COMPANY**, Milwaukee, J. R. STEELMAN has been elected president; E. A. BRUGGER, vice-president and general manager.



Mr. Steelman



Mr. Brugger

★ **THE NEW FAIRBANKS, MORSE** cup for sales achievement went to T. W. DRENNAN as manager of the winning New York sales office. This is New York's fifth such win.

★ **ROBERT H. GLANVILLE** is a new vice-president of PROPORTIONEERS INC.

★ **J. B. HOXIE** is now western division sales manager for OLIVER UNITED FILTERS Inc., manufacturers of sewage sludge dewaterers.

★ **THE COOPER-BESSEMER CORPORATION**, Mount Vernon, Ohio, another welcome newcomer to our advertising pages, has just established a New Orleans regional office and warehouse, under T. E. KRANER, branch manager.

★ **ARTHUR E. POOLE** is new sales manager, filtration fabrics division, FILTRATION ENGINEERS Inc., Newark, N. J.

★ **HARRY J. HUSH** has been elected 1952 president of Associated Equipment Distributors, the national trade association of the construction equipment industry. Here in New York we know him better as vice-president of GRIF-FIN EQUIPMENT CORPORATION and a grand person.

★ **GEORGE D. POTTER** moves up from general sales manager to director of sales for WOLVERINE TUBE DIVISION, Detroit.

★ **C. H. WHEELER** Manufacturing Company, Philadelphia, news includes: ground-breaking for a \$600,000 plant addition with a new centrifugal pump test laboratory. Consolidation with and removal of Economy Pumps Inc from Hamilton, Ohio, as a new division of WHEELER includes transfer of ROBERT J. MACMEEKIN as chief engineer, pump division; and appointment of H. O. FULLAM as chief industrial engineer.

★ **HERE IS CHARLES L. ROUAULT** who has just received GENERAL ELECTRIC'S highest honor, a Charles A. Coffin Award for outstanding work during 1951. Stemming from it is the development of Civil Defense radio receivers that can be made to sound air raid sirens by remote radio control.



Mr. Rouault



Mr. Kraner

★ **C. K. HOOD** is elevated to a vice-presidency of WORTHINGTON CORPORATION (formerly Worthington Pump and Machinery Corp.), directing its Public Works sales activities, among others. W. J. VAN VLECK, promoted from Atlanta district management succeeds him in New York. G. W. KRANER moves to Atlanta.

★ **THE MOST AGGRAVATING** thing about a wife: So often she is right.

LOCK JOINT

serves the
SOUTH



IF YOU'RE FROM THE SOUTH... specifically Virginia, North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Kentucky or Tennessee... our plant at Columbia, South Carolina, is ready and waiting to serve you. This Columbia plant, the fourth of our up-to-date permanent pressure pipe manufacturing yards, is equipped to produce Lock Joint Prestressed Concrete Cylinder Pipe in diameters from 16" to 48", designed for any pressure common to water works practice. The plant's central location in the Southeast makes it possible to deliver the completed pipe speedily and economically throughout this area.

IF YOU'RE FROM ANY OTHER PART OF THE COUNTRY EAST OF THE ROCKIES... our three other permanent pressure pipe plants located at Wharton, N. J.; Detroit, Mich.; and Turner, Kansas, stand ready to provide for your complete Reinforced Concrete Pressure Pipe requirements. All these plants are equipped to manufacture the most carefully designed modern Concrete Pressure Pipe in a large range of standard diameters, and have facilities to handle any contract however large or small.

SCOPE OF SERVICES—Lock Joint Pipe Company specializes in the manufacture and installation of Reinforced Concrete Pressure Pipe for Water Supply and Distribution Mains 16" in diameter or larger, as well as Concrete Pipes of all types for Sanitary Sewers, Storm Drains, Culverts and Subaqueous Lines.

LOCK JOINT PIPE COMPANY

Established 1905

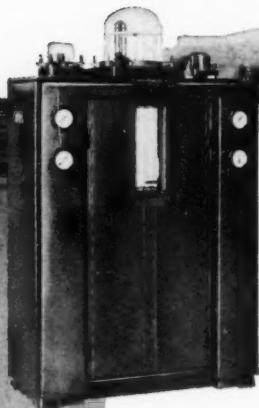
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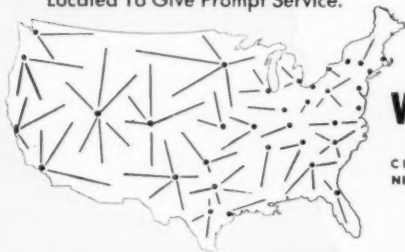
IN W&T CHLORINATORS, TOO

Service, basic research, a complete line of equipment—these are some of the important unseen things back of each W&T Chlorinator.

For example, take readily available service. It's mighty comforting to a waterworks operator to know that back of the equipment which guards the public health in his community is always on call a man who's a specialist in chlorinator maintenance — a man who's personally interested in the welfare of the equipment in his territory — a man who's an expert on chlorinator installations and instructing personnel in the proper care and operation of W&T Equipment.

That's what W&T's Nationwide Service Staff means — perhaps one reason so many plants are equipped with W&T Chlorinators.

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